Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

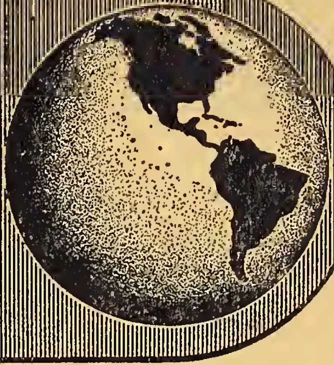
UNITED STATES
DEPARTMENT OF AGRICULTURE
LIBRARY

1862 1889

BOOK NUMBER 1
F752A
v.4
1944
533707

GPO 8—7871

Agriculture IN THE Americas



Issued Monthly by the OFFICE OF FOREIGN AGRICULTURAL RELATIONS
UNITED STATES DEPARTMENT OF AGRICULTURE

IN THIS ISSUE

PAGE
Agriculture Across the Andes 3
Abacá—A New Crop for Latin America 8
Wildlife Management in the Americas 13
Along the Agricultural Front 18

LIBRARY
CURRENT SERIAL RECORD
SEP 2 1944
U. S. DEPARTMENT OF AGRICULTURE

January 1944

USDA
LIB
661121

NAMES & NEWS

Dr. Madrid Is New Director of Agriculture in Colombia

Following his return to Colombia after completing a special course in soil science at Cornell University, *Dr. Carlos Madrid* has been appointed Director of Agriculture in the Ministry of National Economy.

According to the Review of the National Faculty of Agronomy, the return of Dr. Madrid is opportune and timely because the National Government, through the Military and Cadastral Geographic Institute, is now engaging in the extremely important work of making surveys for a soil map of the Republic.

In addition to his work at Cornell, where he received a doctor's degree in agriculture, Dr. Madrid took several study trips through the southern part of the United States where he visited agricultural experiment stations and agricultural colleges, and made detailed field observations of methods and techniques which have been developed by the Soil Conservation Service.

Jader T. de Rezende, an agronomist of the Brazilian Department of Agriculture, is scheduled to return this month to Brazil after completing a practical course in soil and moisture conservation under the auspices of the Soil Conservation Service. He will study SCS work in Puerto Rico for 1 week on his return trip.

Brazilian Doctor Here to Learn Farming Methods

Dr. Edward Cattele Pinheiro, for 4 years the Mayor of Monte Alegre, Brazil, became convinced that he needed practical knowledge of agriculture in order to teach the people of his municipality how to grow crops that would improve their diet. Believing that "learning by doing" would be the best way to get this knowledge, he arranged to get a farm job on a cotton experiment station near Marianna, Ark., where he is driving a tractor, hoeing fields, and doing other practical farm work.

After 4 months of this experience, Dr. Pinheiro will study farm-extension methods, farm credit, vocational agriculture, and rural young people's farm and home work as carried on by 4–H Clubs in the United States. Then he will study agricultural health programs in Texas, the cooperative health program at Taos, N. Mex., and the Farmers' Union cooperative hospital at Elk City, Okla.

During his term as Mayor of Monte Alegre Dr. Pinheiro was manager of an agricultural cooperative comprised of 50 families. He helped organize a cooperative society to aid school children in purchasing books, clothing, and school equipment and was active in a movement to better the diet of school children. He was also instrumental in having a Federal colonization project established in Monte Alegre. Five thousand persons from northeast Brazil settled there in an agricultural cooperative known as *Colonia Nacional do Pará.* Not only this, he was the only practicing physician in a community of 12,000.

Agriculture IN THE *Americas*

Vol. IV • JANUARY 1944 • *No. 1*

538707

Agriculture Across the Andes

The completion of the Central Highway of Peru, which extends from Lima across the Andean ranges to the navigable waters of the Amazon, opens many new fertile acres to agricultural use

by E. C. HIGBEE

Out of Lima's fertile, irrigated, desert valley of the Rimac River up to the dizzy height of 15,740 feet climbs and twists the newly completed Central Highway of Peru. From Colombia to Chile a number of railways and highways join the Pacific coast with the high plateaus of the Andean ranges, but until this year no modern road had penetrated beyond the Andes to navigable waters of the Amazon River basin.

Early in September 1943 President Manuel Prado personally traveled this road and officially declared its completion—the last link of a highway over the backbone of the South American Continent had been forged. Its commercial importance is suggested by the fact that it extends 848 kilometers (about 525 miles) from Peru's capital city, Lima, to Pucallpa, chief river port and airport on the Ucayali River, which is a large navigable tributary of the Amazon. Vessels of as much as 100-ton capacity travel regularly the year round between Pucallpa and Iquitos, capital of the vast jungle-grown Department of Loreto and Peru's principal Amazon shipping center.

After rising from the Rimac River valley the Central Highway (*Carretera Central*) crosses the broad, bleak, mountain-valley plain of the altiplano known for the fabulous Cerro de Pasco copper-mining developments. Gradually it drops down through the two lesser Andean valleys of Huánuco and Chinchao-Tingo María into the tropical jungle flatlands of the Amazon basin. The contrasts in natural scenery and the awe-inspiring feats of engineering seen along the way present an exciting panorama. Interesting, too, is the way crops and tillage practices change with the rapid changes in rainfall, temperature, altitude, and soils.

As one leaves Pucallpa in September it is midsummer in Peru's lower Amazon basin. The distinction between summer and winter in this equatorial region is not one of heat and cold but rather between seasons of light and heavy rainfall. From December to May the rainfall averages about a foot a month, causing the Amazon and its tributary streams to overflow their lower banks making them temporarily unfit for agriculture. Summer rainfall is only several inches a month. The river levels fall, and the low banks again become tillable.

The three general types of land that are cultivated in the Peruvian lower Amazon basin are the *playas*, the *orillas*, and the *alturas*. All of these are represented in the immediate vicinity of Pucallpa.

The *playas* are the annually deposited sedimentary bars and beaches of the rivers which extend only a few feet above the channels during a 3- to 5-month period of low water between June and November. These silt beds assume new shapes each year and often shift to new locations. Each year they are composed of different sand, silt, and clay mixtures depending on the behavior of river currents during June and July.

Mr. Higbee is in the Division of Latin American Agriculture, Office of Foreign Agricultural Relations, assisting in the development of rotenone and other insecticides at experiment stations in the other American Republics.

The cultivated areas of the *playas* are devoted almost entirely to rice and a low-bush bean known locally as *chiclayo*. These are two of the principal food crops of the Amazon. The *chiclayos* are planted on the sandier soils of these sedimentary beds while rice is sown in the choicer, less-extensive hollows and depressions, where heavy depositions of clay have been laid down by trapped or slowly moving waters. The *playas*, being freshly deposited geological formations, are entirely without vegetation until planted or until weed growth develops.

The *orillas* are the low river banks which, during the wet winter season, are either flooded or poorly drained. On the *orillas* and the *playas* are planted most of the beans and rice. Peanuts are also grown in certain districts. Frequently yuca is planted on the *orillas*, where the growing season between floods is longer than it is on the *playas*. Where flooding is not prolonged bananas are found and also sugarcane, from which *aguardiente* (raw rum) and *chancaca* (brown sugar) are made.

On the virgin uncleared *orilla* areas the most valuable jungle products are mahogany and fine rubber. Once cleared, these riverbanks can be kept in cultivation for many years with very little work. The annual floodings and siltings do a fair job of stifling weeds and renewing fertility.

The *alturas* are the low hills or gently rolling uplands and are never flooded. They begin where the land slopes upward from the *orillas*, but they usually rise less than 200 feet above high-water level. The principal villages and cities of the Amazon region are built on the *alturas*. On such lands are produced corn, yuca, bananas, papayas, pineapples, sugarcane, coffee, and cotton. Also grown, and the principal export crop of the region, is the rotenone-bearing plant locally called *Huasca barbasco* (*Lonchocarpus utilis*). Rice is occasionally planted on the *alturas* after the ground has been cleared of forest and weeds and before grasses have taken possession of the land. Weeds, particularly wild grasses, and soil exhaustion make cultivation of highland clearings very difficult and costly after the first few years. Usually such clearings are abandoned after a few crops have been produced, and new areas of virgin jungle are cleared.

Valuable Jungle Crops

Scattered through certain areas of the forest are the trees which produce such valuable jungle products as balata, *lechi-caspi* (chewing gum), weak rubber, low-grade cinchona bark, and the vegetable ivory palm nut, locally known as tagua, from which buttons are made.

The plow, like the mythical "savage" Indian, is unknown to the bank dwellers of the Peruvian lower Amazon. Seed is planted without turning the soil. Nowhere can crops be produced with less effort and equipment than on the freshly deposited silt of the *orillas* and *playas;* yet only a fraction of this land is used.

Amazon farming is largely of a subsistence character. Supplemented by fishing and hunting, its primary purpose is to provide sustenance to the riverbank dweller so that he can carry on his modest commercial activity of gathering jungle products and drying the skins of wild hogs, deer, and the little tigers he shoots with his primitive shotgun loaded with ball-and-black powder. The small, family-sized, subsistence plantings made on the *orillas* and *alturas* after the jungle has been felled and burned are locally known as *chacras*, or small farms. The only produce the larger communities, such as Iquitos, receive from the *chacras* of the bank dwellers is the meager surplus of their subsistence agriculture. When this surplus is too scant, the inhabitants of the cities are obliged to draw in their belts.

The distance from Pucallpa to Tingo María is about 189 miles. Until the opening of the *Carretera Central* this entire region was practically unused and in many places unexplored. For the first 112 miles to the Aguaytía River the land is flat to gently rolling and is covered with dense tropical forests, some of which, along the Aguaytía River, are rich in balsa. As yet no commercial use is made of this balsa other than for the construction of numerous river rafts, which carry freight down the Aguaytía to the Ucayali and often as far as Iquitos itself.

Leaving the Aguaytía, the road crosses the first Andean range which divides the valley of the Huallaga River from the Ucayali River at a point locally known as the *Divisoria*. For the entire distance over the crest of this range into the valley of Tingo María the great forests continue. Colonization of this territory is now being promoted by the Peruvian Government. Scattered along the road are newly developed agricultural lands ranging in size from *chacras*, to large haciendas. The latter, which are primarily devoted to the culture of tea, coca, and barbasco, employ scores of sierra Indians who have been induced to migrate to this region. The tillage methods of the highland areas along the Amazon have been adopted by the new settlers.

The forest is cleared with machete, ax, and saw. A few selected logs felled in clearing the hillsides above the road are laboriously rolled down to the highway, where they are picked up and trucked to one of several small sawmills which have mushroomed along the *carretera*. Usually, however, the great trees with their mesh of climbing vines are left to dry where they have fallen, in one enormous brush heap. Once dried, acres of this tinder are set on fire at a single time. It is only a matter of minutes before flames sweep entire cleared areas,

The spinning stick and weaver's frame are symbols of Andean life

leaving them littered with a smoldering tangle of charred trunks and branches which require years to rot down. The fires burn out as they reach the wet green forest. Soon after this burning, and before weeds get started, corn, beans, bananas, yuca, pineapples, or barbasco are usually planted.

Draft animals such as the ox and the horse are practically unknown. Consequently, seldom are any logs removed or stumps pulled. Where this type of heavy labor is absolutely necessary, as on the tea plantations, it is all done by hand. Cultivation is with the hoe and machete. These primitive methods make it almost impossible for one man and his family to work a *chacra* of more than 8 to 10 acres without outside assistance. Ordinarily a *chacra* ranges from 1 to 5 acres.

Leaving Tingo María, the highway follows the Huallaga River for about 16 miles. All this country corresponds to that around Tingo María itself, where the altitude is about 2,000 feet and the climate delightfully cool the year round. Most land developments along this stretch of the *carretera* are of the *chacra* type, producing food for the family and a little coca for the market. A few plants of cotton, some of them several years old, grow among bananas and yuca to provide fiber for cloth for the family. The spinning stick and a crude weaver's frame, two prominent symbols of Andean life, make their general appearance in the Tingo María valley, where a cool climate makes clothing of more concern than in the Amazon region.

After turning away from the Huallaga River the highway climbs again, this time into the Chinchao Valley, which is one of the principal coca-producing regions of the world. The tendency of the sierra Indian to use coca is a noticeable characteristic. The Indians of the lower Amazon do not use this drug. Most of Peru's coca leaves are consumed within the country. Some are processed for the extraction of cocain. A small amount of cocain and coca leaves is exported.

The extensive coca plantations of the Chinchao Valley begin at the point where the tropical jungle has been checked in its climb up the mountain side, and they end, but for scattered patches, where the mountaintop Carpish rain forest begins. The whole aspect of the landscape in the intermediate coca belt is a distinct contrast to the dense green woodland of the Pucallpa-Tingo María region. For the first time idle agricultural land with no volunteer forest growth makes a broad appearance. The grasses dominate, and there is general evidence of lower rainfall.

Wild cinchona is gathered from the virgin forests

The banana plants get smaller and disappear entirely, as one climbs up the Carpish range. Coca plantations and houses become less frequent. Tea again puts in an appearance in the tropical rain forest, which begins at about 6,000 feet. Wild cinchona is scattered through the virgin forests of this area. Occasionally, one may meet an Indian gatherer carrying bags of this bark along the road.

Guinea pigs become more frequent than chickens as members of the Indian household. A sierra woman invited us inside her home to look at a litter that we had seen scamper through a hole cut in the wall of her house. Beneath the kitchen table the guinea pigs were timidly congregated on a comfortable mat of grass brought from the roadsides for their bedding and food. This manner of caring for the guinea pigs is common in the sierra.

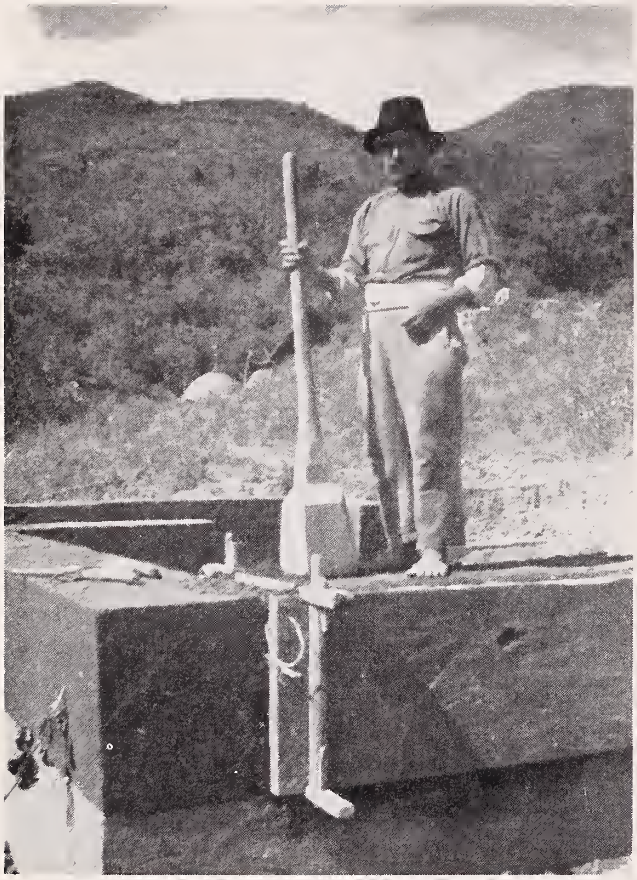
On top of the Carpish range the atmosphere is cold and damp. There are no houses or cultivated fields. Trees grow smaller, more twisted and ragged, while ferns grow taller, more luxuriant and prolific. At the summit, rock surfaces become thickly overgrown with mosses.

Oxen and Plows

Once over the Carpish divide, the agricultural picture changes. Yokes of oxen pull wooden steel-pointed plows across the contours of the steep hillsides. The machete, symbol of forest agriculture, is no longer the principal implement. The hoe and the primitive plow, which breaks open the earth but does not turn a furrow, become important farm tools. Near Carpish the land is operated in small parcels by Indian families. It appears to be fertile and rather newly broken. Potatoes, corn, and beans are the principal crops. September is evidently one of the planting seasons for at this time the cotyledons of the beans are barely above the ground and the potatoes are as yet unhilled dashes of green against the dull browns, rusts, and yellows of the clay earth.

Some houses are built of sticks, chinked and plastered with mud; more frequently their 12- to 16-inch walls are of tamped clay. From a distance these houses seem to have grown from the soil, and, in a sense, they have. With wooden box forms and mallet-headed tamps the Indian farmer-architects build their shelters of the least expensive of raw materials—freshly dug earth shoveled out of the ground at the site of construction.

As one progresses down the valley toward Huánuco,



The Indian farmer-architect builds his own house

agricultural decline becomes increasingly evident. Hillsides patched with fertile fields are no longer present. Families have abandoned the land, leaving gaping areas of nonuse. With each succeeding rain the clay walls of their houses seem to be gradually melting down once more into the earth from which they came. Erosion has taken its toll. There has apparently been a continual agricultural migration, perhaps extending over hundreds of years. This migration of hillside tillers has progressed from the lower valley, where the city of Huánuco is situated, up toward the Carpish Pass. After the soil had washed away from old stone-fenced enclosures, the exhausted fields were abandoned, and new fields higher up the valley were cleared of timber and fern for tillage.

Farther on, the *carretera* once more approaches and runs parallel to the Huallaga River, which skirts the Carpish mountain. What has happened to the soil washed from these rocky mountainsides becomes obvious. Yellow-green fields of sugarcane and deep blue-green patches of alfalfa grow larger and larger as the valley floor widens. In the vicinity of Huánuco soil depositions have had a widening effect on the valley floor. Few people live on these mountainsides. All life seems to have gravitated with the soil itself into the valley floor. Extensive sugar estates, with their narrow-gage field railways for moving cane, spread over this rich bottom land, leaving scattered patches of alfalfa, corn, and table vegetables. Irrigation ditches crisscross the fields, some of them bordered with fast-growing eucalyptus trees, which are used for construction timbers.

Huánuco itself is a village of the sierra Indians. In the markets and stores are the products they consider essential to life—dried beans, rock salt, corn of miscellaneous types, and potatoes both fresh and dried. Green alfalfa is sold in tiny bundles for household guinea pigs and chickens. The ubiquitous gunny sack of coca with its top rolled back to expose a mound of dull-green leaves stands prominently, like the cracker barrel in our own old-time country stores. Small gourds for carrying the coca chewer's lime are strung above counters on looped strings.

The dried potatoes are of two varieties: Those called *papas secas*, which are sliced, boiled, and dried in the sun; and *chuños*, which are small potatoes desiccated by prolonged exposure to the frost of the altiplano. The storekeeper assured us these potatoes would keep for years, and we were inclined to agree with him as they had every appearance of being petrified.

Up from the valley of Huánuco, the *Carretera Central* climbs steeply toward Cerro de Pasco and the bleak windswept altiplano. The mountains close in on either side, and the Huallaga River gradually narrows to a trickle. Once beyond the valley bottom's broad fertile canefields, tillable land again ceases to be continuous. One sees stone-fenced remnants of land still capable of producing potatoes and corn for the Indian families who live on them. There are no work animals because the hills are too steep for their use. Goats and sheep are the principal barnyard occupants, since they are more capable than cattle of converting the feed of the cactus-studded wastelands into milk and sun-dried meat.

Some Land Too Steep for a Plow

A bow-handled digging instrument, doing the work of the plow, makes its appearance. It is a thin steel blade about a foot long and 5 inches wide mounted on a two-handled, arched pole resembling somewhat a scythe handle. The blade is stepped vertically into the ground like a spade. When the digger leans his weight on the two hand grips of the arched pole, the blade pushes its way up through the earth, turning the soil. It is well adapted to the steep hillsides, where plowing with oxen would be difficult and where a well-worked seedbed must be prepared for potatoes. It is also used on small landholdings, where the maintenance of oxen would be uneconomical. Later we learned at Lima's La Molina Agricultural Experiment Station that this primitive hand plow is a direct descendant of a similar implement used by the Incas. Ancient types found in excavated tombs have blades of hardwood. These were later succeeded by a model made with blades of copper.

Near the end of the climb toward the Cerro de Pasco range the topography flattens out somewhat. The number of cattle and sheep increases as vast stretches of grasslands appear. For the first time, the long-necked, shaggy-haired llamas are observed grazing or carrying loads along the road. All forms of woody growth disappear. For their cooking fuel the Indians gather dried clods of cattle manure or cut thin square sods from the turf of the grasslands. Until they are dry enough to burn, these clods and sods are neatly piled, "woodpile" fashion, either in the yard or alongside the tamped-earth and rock houses just under overhanging roofs for protection from the rain.

Cotton has been replaced by wool on the spinning stick which almost every Andean woman industriously twirls wherever she goes, to make thread for her family's clothing. Ponchos worn by the men grow longer as the altitude and the cold increase. Heavy wool socks, brightly colored, are common. They are a striking contrast to the black-banded panama hats which are the pride of the sierra Indian woman.

Stretching from Cerro de Pasco to Oroya are the broad expanses of sierra grasslands, cold and windswept. Horses are common, but the llama is the principal pack animal. Sheep graze in flocks of various sizes, and cattle are numerous. Potatoes and barley are two of the principal crops. More land appears to be suitable for meager subsistence agriculture than is actually in use. The choicest fields are protected from grazing animals by rock fences. Hillsides are spotted with these small fields. When the fertility of a field decreases, the rock fences are moved to protect another patch of ground thought suitable for cropping. Ribbed outlines marking long-abandoned fields once protected by these rock fences are almost as distinct as the fences themselves now rearranged in their new locations.

An agricultural scene near Huánuco, Peru

Pyrethrum plants are in blossom from May through January near San Juan

Out of Oroya the *carretera* climbs to its highest point of 15,740 feet, where the asphalt is often covered with a thin sheet of ice or snow. Only llamas are observed grazing in any number. This area is surrounded on all sides by snowcapped peaks, from which flow small glacial streams. On the descent from this high point, no agricultural activity is evident until after a drop of roughly 2,500 feet. Then small patches of potatoes appear. At an altitude, according to roadside signs, of 11,000 feet corn is again observed, and alfalfa patches are more numerous. Throughout the upper valley of the Rimac, small patches of alfalfa are planted along the rocky banks of the river. Most of this is baled and shipped to Lima, where there is a shortage of hay for horses and dairy cattle.

As the irrigated mountainsides become less steep, stone-walled terraces appear, some of which have disintegrated. Stones have fallen from the walls, and the tiny shelves of washed-out land are overgrown with weeds. Others, covered with a rich green mat of alfalfa, are in neat repair. The average life of alfalfa in these fields is 10 to 15 years. At Matucana one plot has not been replanted in 45 years. All year round these irrigated patches grow to bloom stage and are then cut by hand with machetes and sickles. The alfalfa is left as it is cut, to dry in the field. Afterward it is gathered in bundles and carried by the growers from the rocky hillsides to central baling points.

Along the winding descent of the *carretera* are frequent patches of eucalyptus trees planted on the stony bank lands beside the Rimac River. Occasionally irrigated fields abandoned for all other purposes are planted to these remarkable trees, which in 4 to 5 years produce timbers 6 to 8 inches in diameter. These are finding a ready market at the mines for a dollar and a half apiece and are one of the best cash crops in this region. At the

(Continued on page 12)

Abacá—A New Crop for Latin America

Experiments show that abacá fiber grown in the Western Hemisphere is equal in quality to that grown in the Philippines, heretofore the only source for this important hard fiber

by HARRY T. EDWARDS

On ships that sail the seven seas, and in nearly all countries of the world, Manila rope is a well-known and very important product. The life of the sailor, the miner, or the builder often depends on the strength and reliability of the rope or cable which he is using; by long experience Manila rope has proved to be strong and reliable. But relatively few persons know much about abacá (Manila hemp), the raw material from which Manila rope is made.

One reason for the lack of knowledge about abacá has been the fact that heretofore the entire world supply of this fiber has been obtained from islands of the East Indies. A journey to the Orient was necessary if one wished to see abacá in its native environment. These conditions have been changed by the establishment of abacá plantations in several of the countries of Central America.

Abacá—Plant and Fiber

The abacá plant, *Musa textilis*, resembles in appearance the banana plant, to which it is closely related. A mature abacá plant or "mat" consists of a group of stalks from 6 to 12 feet in height which are formed by the broad overlapping leaf stems. At the top are large spreading leaf blades from 3 to 6 feet long and about 12 inches in width. The fiber is obtained from the outer portion of each successive leaf stem. The color of the stalk ranges in the different varieties from a light green to a dark purple or nearly black. When the plant matures, a flower stalk about 2 inches in diameter is pushed up through the center of the stalk, bearing flowers at the top, which are followed by fruits that are similar to small bananas except that they are filled with black seeds. Abacá plants grown from these seeds do not ordinarily come true to type, and the usual method of propagation is by the use of rhizomes or suckers. Abacá requires a warm, moist, tropical climate and a deep, fertile, and well-drained soil.

Abacá fiber is included in the group of so-called "hard" fibers obtained from the leaves and leaf stems of plants. It is a multi-celled long fiber consisting of cylindrical strands of fibro-vascular bundles. Philippine abacá fiber of "excellent" cleaning is ordinarily from 6 to 12 feet in length, white to light ochre in color, lustrous, strong, and of clean, even texture. Western Hemisphere abacá fiber, which will be machine-cleaned, will range in length from 4 to 6 feet and may be somewhat less uniform in color than the Philippine fiber. It will have, however, the same basic qualities of exceptional strength and resistance to the action of salt water that are characteristic of Philippine abacá. The combination of strength, durability, and water resistance makes abacá the most valuable known fiber for marine cordage. It is also extensively used for transmission and hoisting rope, well-drilling cordage, and for many other purposes where exceptional strength and durability are required.

The author of this article is on the staff of the Bureau of Plant Industry in charge of Department of Agriculture research on plant fibers other than cotton. In 1925 Mr. Edwards directly supervised in Davao Province of the Philippines the collection and preparation for shipment of the abacá plants which were shipped to the Canal Zone. He took care of them on the 43-day voyage of the S. S. *Ethan Allen.* He thus played an important part in establishing the plantings of abacá in Panama from which this strategically important fiber is now being grown.

Abacá in the Philippines

In all probability abacá had been known and used in the Philippine Islands for centuries before the arrival of the first European explorers. When Ferdinand Magellan visited the Philippines early in the sixteenth century the natives were using this fiber for making textile fabrics. During the next 300 years the Spaniards used limited quantities of abacá for the manufacture of cordage, and in 1818 a few tons of abacá fiber were shipped from Manila to the United States. The use of abacá developed rapidly after that time until by the end of the nineteenth century it had become the principal Philippine export product and the leading cordage fiber of the world.

In the Philippine Islands abacá fiber is produced under a wide range of conditions. There are thousands of small abacá fields in the foothill regions of southern Luzon, the Visayan Islands, and northern Mindanao. The Filipino planter clears a small area of forest land and plants the abacá rhizomes or suckers in holes that have been dug with a machete. There is no cultivation except an occasional clearing of shrubs and grass. When the plant matures, the fiber is cleaned with a crude hand-stripping apparatus, dried in the sun, and usually sold to a Chinese middleman, who, in turn, sells it to one of the large exporting firms.

In the southern part of the Philippines, particularly in the Province of Davao in the Island of Mindanao, many large and efficiently operated abacá plantations have been developed during the past 30 years. On these plantations new systems of planting have been introduced, and attention is given to the selection of the superior varieties of abacá; cover crops are grown, and in some instances the abacá fields are cultivated. The hand-stripping method of cleaning the fiber has generally been replaced by a small machine, and on two or three of the Davao plantations large, automatic, fiber-cleaning machines are now in use. These machines are in some respects similar to those that will be used for cleaning abacá fiber in Central America. As a result of these improvements there has been in Davao a large increase in yield and a marked improvement in the quality of the fiber.

Abacá Introductions

Many attempts have been made to grow abacá in countries other than the Philippines, but most of these experiments have been unsuccessful. There are records of abacá introductions into India, the Andaman Islands, New Guinea, the Federated Malay States, the Solomon Islands, and the West Indies, but in none of these did the commercial production of abacá fiber become an established industry. As abacá can be propagated from seeds, and as the seeds are readily available and easily transported, it is probable that this method of propagation was used in most of this experimental work. The fact that abacá does not usually come true to type when grown from seeds was either unknown or failed to receive consideration. The numerous failures with this plant in tropical countries of both the Eastern and the Western Hemispheres led to a widespread belief that abacá could be successfully grown only in the Philippine Islands.

Courtesy of the Philippine Bureau of Science

The development of better machines for processing abacá fiber is a progressive stride over this hand-method of doing the job

During the period from 1902 to 1912 numerous shipments of Philippine abacá seed were received by the United States Department of Agriculture in Washington. Several lots of seedling plants were grown in the Department's greenhouses, and these plants were distributed in different countries of Central America and in the West Indies. Reports concerning the development of these plants indicated that seedling abacá was not dependable, and this work was, therefore, discontinued. Machines for cleaning abacá fiber were not available at that time, and it seemed unlikely that production of this fiber would be practicable in the American Tropics with the hand-cleaning methods used in the Philippine Islands.

Latin America's Abacá Project

Persons familiar with conditions in the Orient and also with the world fiber situation had long realized that there was an element of danger in having the entire world production of abacá fiber confined to limited areas in the East Indies. It was clearly evident that the occupation of the Philippines by enemy forces, and the closing of the Pacific sea lanes, would entirely eliminate our supply of this essential raw material at a time when it would be urgently needed. This situation, together with the additional facts that the Philippine abacá industry was threatened by a recently discovered plant disease, and that a machine for cleaning abacá had been developed, revived interest in the possibility of bringing abacá to the Western Hemisphere.

Plans for handling this work were drawn up by the United States Department of Agriculture, and in February 1922 a survey was made of areas in the Canal Zone and Panama to ascertain if conditions in these regions were favorable for abacá. The survey showed that in the Canal Zone neither climatic nor soil conditions were entirely suitable for the cultivation of this plant. Moreover, only limited areas of land that could be used for abacá were then available in the Canal Zone. A survey was then made of the Almirante region in the Province of Bocas del Toro, which is in northwestern Panama and adjacent to southeastern Costa Rica. At that time this was one of the principal banana-growing areas of Central America. Experimental work with seedling abacá conducted on a large banana plantation at Almirante showed that both climatic and soil conditions of this region were exceptionally favorable for abacá. Arrangements were made with the owners of this plantation for the establishment of a cooperative abacá experimental project. The work was to be started as soon as the necessary propagating material could be obtained from the Philippine Islands.

A shipment of about 400 abacá rhizomes was collected in the Province of Davao in the Philippines and forwarded to Panama during the summer of 1923. None of these plants survived the long voyage, and their condition upon arrival indicated clearly that special precautions would have to be taken in any future shipments to prevent the introduction from the Orient of dangerous insect pests or plant diseases. The following year a few small abacá suckers were brought from Manila to Washington, but the plants arrived in poor condition and finally died. These experiences indicated the necessity of making shipments of abacá plant material from the Philippines directly to Panama, and the advisability of bringing not only rhizomes and suckers but growing plants as well.

Courtesty of the Philippine Bureau of Science

Abacá at Malita in the Philippines sometimes grows to five or six times the height of a man

The collection and preparation for shipment 10,000 miles overseas of a large consignment of plant material, including several hundred growing plants, involves careful attention to many details. Preliminary arrangements for the shipment of these plants were made in Washington early in 1925, and the work of collecting and preparing the plant material was started in the Philippines in June of that year. The material was obtained in the Province of Davao, in the southern part of the Island of Mindanao, which has several of the superior varieties of abacá and which, at that time, was relatively free of abacá diseases. A preliminary survey was made of different areas from which these plants might be obtained, and areas were selected where no evidence of abacá diseases existed. Before the material for the trans-Pacific shipment was finally prepared, rhizomes and suckers were collected and various methods of cleaning, drying, and packing were tested.

During June and July about 450 rhizomes and suckers were planted in movable containers, and in August nearly 900 rhizomes were prepared and packed in crates. This collection of some 1,350 plants was loaded on the S. S. *Ethan Allen*, which left Malita, Davao, on August 21 and arrived at Colón in the Canal Zone, after a voyage of 43 days, on October 3, 1925. From Colón the plants were forwarded to Bocas del Toro in Panama, where they were again transshipped to a quarantine station on Columbus Island.

When these plants were received at the quarantine station, about 73 percent of the original shipment, or about 1,052 plants, were alive, and some 750 of them were in good condition. A small plant cage had been constructed at this station, in which 152 plants were placed. The others were planted outside the cage. After the work of planting at Columbus Island had been finished about 50 selected plants were taken to the Plant Introduction Gardens in the Canal Zone.

The conditions on Columbus Island were by no means ideal for abacá, and many of the plants that were alive when the shipment was received failed to grow. Three months later, in January 1926, about 500 good strong plants were reported. The progeny of these 500 plants have furnished the material for planting more than 26,000 acres of abacá during the past 2 years in four different countries. A small field planting of abacá, which was subsequently abandoned, was made on Columbus Island early in 1926, and in May of that year all the plants in the nurseries were removed to the mainland. The total abacá area in Panama at that time, including the planting on Columbus Island, was less than 2 acres.

To ascertain the practicability of undertaking the growing of abacá in this region as a commercial crop, experiments were necessary to determine the suitability of the climatic and soil conditions for the plant, its immunity from or resistance to the so-called "Panama" disease of the banana plant, and the type and quality of fiber produced from abacá plants grown in Panama as compared with that obtained in the Philippine Islands. Experimental work demonstrated in a relatively short time that the natural conditions were exceptionally favorable. The plants made a luxuriant growth and attained a size equal or superior to that of abacá of the same age grown under the best conditions to be found in the abacá regions of the Philippines. During the earlier stages of the experiments there were indications that the disease problem might be serious. Many of the young plants developed what appeared to be "Panama" disease. Fortunately, however, abacá proved highly resistant to this disease and, as the plants became adjusted to their new environment, the disease gradually disappeared. Although an occasional young or poorly developed abacá plant will now show signs of "Panama" disease, there seems to be no probability of any serious or widespread damage.

In 1927, fiber-cleaning experiments were conducted, and samples of the fiber were tested at the National Bureau of Standards in Washington. These experiments proved that Panama abacá compares favorably with the superior grades of Philippine abacá. Cordage manufacturers who examined the fiber were of the opinion that it would be an entirely satisfactory substitute for the Philippine product.

After 2 years of experimental work, field plantings of about 50 acres were made. With this larger acreage, comparisons could be made of the different varieties when grown under field conditions, and the relative values of different methods of planting could be determined. By means of a small fiber-cleaning machine, received from the Philippine Islands, about 1,000 pounds of fiber was cleaned. The rope that was manufactured from this fiber proved to be of essentially the same quality as Manila rope made from Philippine abacá fiber. Sufficient information apparently had been obtained to justify the establishment of abacá production in Panama on a commercial basis, and plans were prepared for a 1,000-acre planting.

Unfortunately the world-wide industrial depression developed at about this time. For several years the prices of all hard fibers were abnormally low, which indicated that abacá fiber could not be produced profitably in Latin America under prevailing conditions. Except for the maintenance of fields already planted, no further development of abacá cultivation was made in Panama for about 6 years.

Better Machinery Required

Conditions in the fiber market had improved by 1937, and during the second half of that year the plantation company interested in this project planted about 1,000 acres of abacá in the Almirante region of Panama. Experimental work was also conducted in the development of a new machine for cleaning abacá fiber. This relatively large field planting furnished the conditions and material required for further study of different agronomic and economic problems.

Courtesy of the Philippine Bureau of Science

Unloading abacá fiber at a warehouse in the Philippines

A second planting of 1,000 acres was made in 1939 and 1940, and the machinery investigations were continued. Up to that time efforts to develop an entirely satisfactory machine for cleaning abacá fiber had been unsuccessful, and until such a machine was available further expansion of the field plantings was considered inadvisable.

The first 11 months of 1941 brought another "depression" period in the Panama abacá project. Two thousand acres of abacá had matured and was ready for cleaning. The use at Almirante of the small fiber-cleaning machines used in the Philippines had proved impracticable because of high labor costs, and the new machine had not been completed. In the meantime war clouds were gathering, and large stock piles of Philippine abacá were being accumulated in the United States. There were numerous indications that Western Hemisphere abacá might be needed, but with conditions in the Orient still in the pending stage neither the Government nor commercial interests were prepared to take the action required for the establishment of this work on a definitely commercial basis. The happenings of December 1941 served to clear the atmosphere with respect to Western Hemisphere abacá, and the urgency for immediate development of this project could no longer be questioned.

Early in 1942 arrangements were made for a large expansion of the abacá acreage in Panama and also for plantings in Costa Rica, and subsequently provision was made for the planting of abacá in Guatemala and Honduras. A large fiber-cleaning machine was purchased and installed at Almirante, and the planting program was soon under way. At the end of September 1943 a total of 26,615 acres of new plantings had been made, including 11,472 acres in Costa Rica, 5,716 acres in Guatemala, 5,012 acres in Honduras, and 4,415 acres in Panama. Nearly 3,000,000 pounds of abacá fiber have been cleaned at Almirante, of which about 2,800,000 pounds have already been shipped to the United States. New fiber-cleaning machinery and equipment are now being installed, and there should be a marked increase next year in the production of fiber. The present program calls for a total planting of about 40,000 acres, which should yield annually, when in full production, from 50 to 60 million pounds of fiber.

Consideration has been given to the feasibility of planting abacá in other countries of Latin America, but for the present this work should, perhaps, be confined to the countries in which plantings have already been made. Under normal peacetime conditions Western Hemisphere abacá fiber will necessarily have to compete with abacá and other hard fibers produced in the Eastern Hemisphere. Determinations cannot be made at this time as to what supplies of fiber may be available after the war or what will be the post-war consumption of the different fibers. Conclusions have been reached that abacá can be produced in tropical regions of the Western Hemisphere, and that large quantities of this fiber will be produced for use during the war period. Attention is now being given to the introduction of new and improved methods of production and fiber processing. These improvements will tend to reduce the production costs of this fiber. Prospects are good that abacá, now a new crop, will become a permanent crop in Latin America.

AGRICULTURE ACROSS THE ANDES

(Continued from page 7)

Peruvian Government's experiment station at San Juan are freshly cut and peeled logs lying in the running water of an irrigation canal at the side of the *carretera*. Ingeniero Burga, Director of the station, explained that by lying 20 days in running water the logs lose their green-wood sap. Small timbers treated in this manner will last 10 to 12 years in the mines.

In the region of San Juan are a number of pyrethrum plantings. Being a perennial, like alfalfa, this crop also is well adapted to the hilly stone-terraced topography, where the ideal plants are those whose roots will hold the soil the year round. Except during the rainy months of February, March, and April the pyrethrum plants of this region blossom continuously.

As the *carretera* approaches the coast from the heights of the sierra, it passes from a region of short seasonal rainfall to the Lima coastal plain, where rain so seldom falls that umbrellas and rubbers can be bought only in shops that cater to sierra and Amazon travelers.

Perhaps the most striking feature of the lower Rimac Valley is the irrigation line which sets off the arid hillsides from the lower slopes and valley floor. This line of irrigation canals, carrying water diverted from the Rimac River, becomes more distinct nearer the coast. It winds like a green belt around the contours of the hills. Most of the canals are simply dug out of the earth but here and there they have been laboriously constructed of stone where they cross gullies or run by the bare rock faces of the lower foothills. The contrast in color between the green irrigated fields below and the sparse, cactus-studded, dry-brown hills above this irrigation line is one of the most impressive sights along the whole length of the *Carretera Central*.

As the coastal plain is approached, cotton becomes the most important crop. Corn, flax, and beans are also prominent. In September the cottonfields are cleared of the black brush of the past season, which is cut and stacked in mounds like haycocks. Later, this brush is carried to central piles in the fields and burned. From the stumps of the hacked-off cotton plants a ratoon crop sends out its first leaves.

Near Lima there are vegetable farms on either side of the *carretera*. A great variety of table vegetables are constantly harvested from these neat and irrigated gardens. Peas, beans, corn, melons, carrots, beets, cabbage, lettuce, peppers, cauliflower, and tomatoes are the most common.

At the end of the journey, just outside the city of Lima, is Peru's famous La Molina Agricultural Experiment Station, best known for its work on cotton. A unique agricultural museum has been assembled here by Ingenieros Vivanco and Flores. From the unearthed tombs of the Incas and their predecessors have been brought clay household water jugs and decorative pottery moulded in the form of the agricultural products of their time: Corn, potatoes, peppers, yuca, squash, peanuts, etc. Other pottery is painted with beautifully colored stylized representations of these plants. Among the museum's possessions are wooden blades of the bow-handled Incan plow.

Here at La Molina the close relation of the Western Hemisphere's agricultural present to its past is brought sharply into focus. Side by side with modern research laboratories and experimental field plots is this well-organized museum dedicated to the achievements of America's early Indian agriculturists, to whom we are indebted for so many of today's most important economic plants.

Wildlife Management in the Americas

The settlers of any country have always depended heavily upon wildlife to sustain them. Fortunately, legislation now protects many forms of wildlife once threatened with extinction

by FREDERICK C. LINCOLN

Human welfare and an abundant wildlife are coincident relationships. We may, in fact, say truthfully that wildlife is an important factor in our whole living economy, not only for its esthetic and recreational values, but also for the definite contributions that it makes to our economic welfare. Preeminent among the regularly renewable natural resources, the perpetuation of an abundant supply of the desirable forms of wildlife depends not only upon wise management and utilization but also upon the careful preservation of adequate seed stocks. These are matters that must have full consideration, for without them the New World could become a near biological desert.

Up to a comparatively few years ago the history of wildlife in the Western Hemisphere, from the coming of the first Europeans, was such as to give little comfort or encouragement to those who realized the great values of this resource and its importance in the development of our civilization.

The white pioneers and explorers who first saw the broad plains, dense forests, and great marshlands of North and South America, found an abundance of game and other wildlife beyond description. The birds, mammals, and fishes were of inestimable value in aiding the settlers to establish themselves. Supplies had to be brought from Europe over a long and hazardous ocean route. Consequently, for long periods of time the pioneers found themselves dependent upon game and fur animals for a great proportion of the essentials of life. This in itself did not result in a serious drain upon the resource, but necessity was soon followed by unchecked and unregulated exploitation.

Some of the great American fortunes were founded upon the fur trade. In a few years, remote trading posts garnered a fabulous wealth and left to posterity scarcely more than scattered remnants of what had been a tremendous resource. Beaver skins were shipped to eastern markets in carload lots and some of the more highly prized species, as the marten or American sable, the fisher, wolverine, and sea otter, were so reduced that saving them may be impossible. In South America the chinchilla was nearly exterminated for the sake of its lovely fur. Its coat of fine wool brought a similar disaster to the little camel-like vicuña. Even the rhea, or American ostrich, was hunted persistently for its feathers, which had found commercial use in the form of feather dusters.

Traffic in game for food purposes flourished unchecked; uncounted millions of birds and mammals were annually sent to market. The tremendous flocks of passenger pigeons were completely exterminated by the market hunter. Herds of buffaloes, estimated to have numbered 15 million or more, were reduced to the few hundred now found in zoological parks and behind the fences of refuges. Ducks, geese, deer, elk, and many other native species were regularly featured items on the menus of the so-called "better" restaurants. Wildlife in general was ruthlessly sacrificed under the mistaken belief that the supply was inexhaustible.

Not only were the animals themselves wastefully killed; their habitats also were steadily taken from them or so altered as to make their continued tenancy difficult or impossible. Perhaps much of this habitat destruction was unavoidable and can be justifiably charged to the advance of civilization. Nevertheless, the draining of thousands of acres of marshland that produced nothing but barren peat bogs, lowered water tables, and an intolerable burden of public debt, or the use of thousands of miles of rivers and smaller streams for the disposal of civic and industrial waste are difficult to reconcile to any well-considered plan. In truth, no plan existed. We now realize that the drainage and reclamation of about 100,000,000 acres of marshland in the United States alone operated as effectively to reduce the continental population of waterfowl as did the guns of the market hunters, and that the pollution of almost every major river of the Atlantic seaboard did as much or more to destroy the runs of salmon as did the nets of the commercial fishermen.

The author is Biologist in Charge, Migratory Bird Investigations, Fish and Wildlife Service, U. S. Department of the Interior. This article is adapted from an address delivered by Dr. Lincoln at the Second Inter-American Conference of Agriculture at Mexico City, July 5–16, 1942.

Depletion of the native forms of wildlife and the damage caused by misguided introductions of exotic species finally resulted in the passage, in 1900, by the Congress of the United States, of the Lacey Act. This law enlarged the powers of the Federal Government to include the preservation, distribution, introduction, and restoration of game and other wild birds. It also made unlawful the interstate shipment of birds and mammals that had been taken in violation of the laws of any State, Territory, or District. Its administration was entrusted to the Biological Survey, now a part of the Fish and Wildlife Service. This marked the beginning of the National Government's work in the conservation of wildlife, although as far back as 1868 the Congress had given the Secretary of the Treasury authority to regulate the killing of land and marine fur-bearing animals in Alaska.

A Place to Live for Wildlife

By the creation of the first refuge in 1903, recognition was given by the Federal Government to the fact that wildlife must have a place to live. The refuge, known as the Pelican Island Reservation, was on the east coast of Florida. It was established to protect a nesting colony of brown pelicans. This action, taken by an Executive order of President Theodore Roosevelt, was followed by the creation of several big-game refuges under acts of Congress. The first, in 1905, was on the Wichita Forest Reserve in Oklahoma. It was followed, in 1908, by the National Bison Range in Montana and the Elk Refuge in Wyoming and, in 1912, by the Wind Cave National Game Preserve in South Dakota.

The supposition had long been that migratory birds were not in need of protection and that hunting of them should be allowed whenever they were present within the limits of a State. Nevertheless, there were many who believed that an adequate supply could not endure indefinitely if the several States continued to authorize unreasonably long shooting periods. The farsighted sportsmen and conservationists realized that there should be some uniformity in open seasons and in bag limits, and that to achieve this objective and ensure preservation of the supply the authority to protect such birds should be vested in the Federal Government. Not until 1913, however, did Congress pass the Migratory Bird Law. Certain interests in many States attacked the constitutionality of this law in the courts. In some of them it was upheld and in others it was declared unconstitutional. Before its status was finally determined by the Supreme Court, it was superseded, in 1918, by the Migratory Bird Treaty Act, passed to give effect to the treaty with Great Britain for the protection of the birds that migrate between the United States and Canada.

This instrument, signed in 1916, was the first international covenant for the protection of any wildlife species. It stated that both governments "being desirous of saving from indiscriminate slaughter and of insuring the preservation of such migratory birds as are either useful to man or harmless, have resolved to adopt some uniform system of protection which shall effectively accomplish such objects." It was to be in effect for 15 years, and, if neither contracting power gave notification 12 months before the expiration of that period of intention to terminate its operation, it was to continue in force from year to year indefinitely. It continues to operate and is, without doubt, the greatest single factor assuring the perpetuation of the migratory birds of the Western Hemisphere.

In 1936 a similar treaty was signed by the proper officers of the United States and the United Mexican States, which not only gives protection to 8 families of migratory game birds and 23 families of migratory nongame birds, but also provides for the regulation of transportation of such game mammals as antelopes, mountain sheep, deer, bears, peccaries, squirrels, rabbits, and hares, over the United States-Mexican border. This treaty also carries a provision that protection may be extended to other migrants by common agreement between the Presidents of the United States of America and the United Mexican States. The Migratory Bird Treaty Act was immediately amended by Congress to extend its provisions to this treaty. Under the operation of the act, spring shooting and the sale of migratory game birds have been prohibited in the United States and Canada, and many other restrictions have been imposed to limit the number of birds taken each year by hunters.

The success of these two treaties in preserving important elements of our fauna was so outstanding that the Eighth International Conference of American States, meeting at Lima, Peru, in December 1938, adopted a resolution to provide for the establishment by the Pan American Union of a committee of experts to study problems of nature protection and wildlife preservation in the American Republics and to formulate a draft convention for the preservation of the flora and fauna in the Western Hemisphere. The Governing Board of the Pan American Union, in accordance with this resolution, called the meeting in Washington, D. C., during May 1940.

As a result of the deliberations of this committee the draft of a convention was prepared to cover the important basic requirements. The original of the draft was signed in Washington on October 12, 1940, subject to ratification by the respective governments. Article XI provided that it would come into force three months after the deposit of not less than five ratifications with the Pan American Union. On January 31, 1942, the Republic of Haiti became the fifth country to deposit its ratification. Thus the convention came into force on May 1 of that year. Under its terms, the high contracting powers will take appropriate steps to ensure the preservation of their respective floras and faunas, their natural wonders, historic objects, and wilderness areas. According to the latest information eight countries—the United States, Guatemala, Venezuela, El Salvador, Haiti, the Dominican Republic, Peru, and Mexico—have deposited their articles of ratification with the Pan American Union. Eleven other countries signed the original convention, and their ratification is, therefore, to be expected.

The migratory waterfowl of the North American Continent, robbed of their homes, and killed each season in numbers greater than the normal increase, had decreased from an estimated total of from 100,000,000 to 150,000,000 in 1900 to a mere 27,000,000 during the early years of the last decade. Alarm swept the country. There were many conservationists who felt that all hunting would have to stop in order to prevent extermination of some game species.

Two Basic Needs

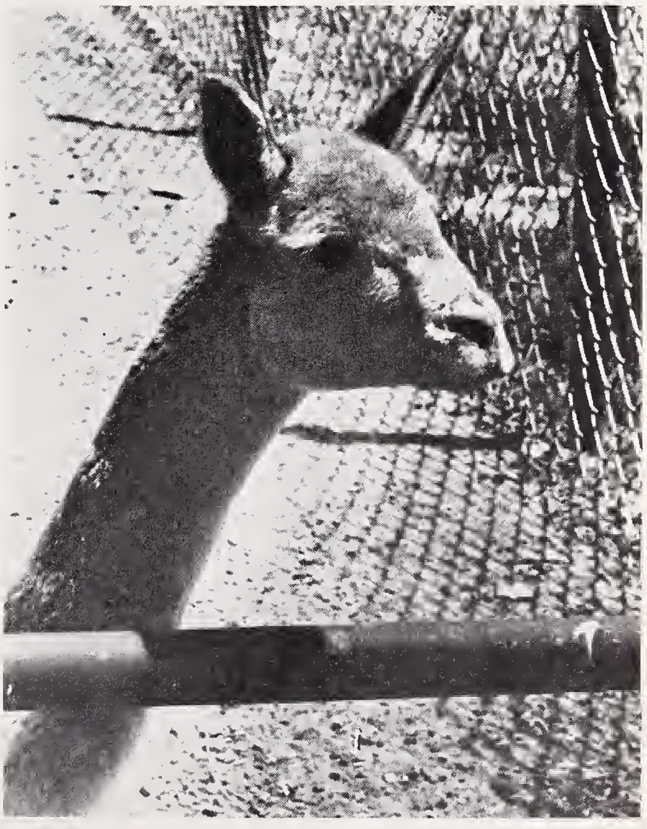
As far as any wildlife species or group of species is concerned, there are but two basic needs. One of these is a sustained breeding stock. Only ducks can produce ducks, and an annual kill that is larger than the annual crop can have but one ultimate result. The other need is for areas of land and water that meet the requirements for feeding, breeding, and living in comparative safety. Birds cannot nest on the wing, nor can mammals reproduce on the run. Briefly, these are the basic concepts of the waterfowl-restoration program that was inaugurated on a Nation-wide scale in the United States, and which in 7 years has more than trebled the continental population of ducks and geese.

As previously stated, the Federal refuge program was initiated when President Theodore Roosevelt created the Pelican Island Reservation in 1903. Other bird refuges were established from time to time, but in 1929, with the passage of the Migratory Bird Conservation Act, the refuge program really got under way with an authorization of some 10 million dollars to purchase and develop waterfowl refuges. The authorizations provided were never reached, but with those sums that were appropriated a number of refuges were purchased and developed. By 1933, approximately 1,600,000 acres of land were included in the refuge system, at which time emergency funds became available to extend and accelerate the program, so that there are now more than 17½ million acres in the Federal refuge system, and more are being added each year. Additional impetus was given to this movement by the passage in 1934 of an act requiring all waterfowl hunters over 16 years of age to obtain a Federal hunting stamp costing $1.00. These so-called duck stamps have produced more than $7,240,000 for the waterfowl-restoration program.

The creation of these areas and their development for the needs of the wild creatures that occupy them, coupled with scientific regulation of the annual harvest, have efficiently demonstrated that any land can have wildlife in abundance if it has the will to do so. The era of wildlife exploitation is now drawing to a close in much of the Western Hemisphere, as it has already done in most of the Old World. Its last stages are marked by the increasing determination of national and local agencies, of sportsmen and conservationists, and of the general public to apply positive methods and administrative policies that will prevent further unnecessary losses of wildlife and that will restore the desirable species to the maximum abundance that is consistent with modern civilization.

The following examples illustrate how wildlife management is taking hold in the countries of South America.

The beautifully furred chinchilla of the Andes is now accorded strict protection in Peru, Chile, and Bolivia. It has been successfully reared on a commercial scale on the ranch of Sir John Murray at Villenar, Chile, and similar attempts are under way at fur farms in California, Virginia, and in England. As early as 1825 Peru also gave legal protection to the vicuña, but not until October



The vicuña, whose wool is said to be the softest of all known animal fibers

8, 1920, was a decree passed prohibiting the making of goods from vicuña wool and forbidding the sale of skins. Similarly, in Bolivia, laws passed in 1920 and 1922 prohibited the export of vicuña wool and hides. These were the first necessary steps for the preservation of this interesting and valuable animal. Peru now reports having successfully reared them in captivity. Vicuña wool—said to be the softest of all known animal fibers—may once again be placed in the channels of trade. It will come, however, from living animals produced under scientific management.

Credit must also be given to Peru for the wise management of one of the world's largest bird colonies. In June 1939 an estimate was made that on the three Chincha Islands there were more than 11 million guanays or cormorants, piqueros or boobies, and alcatraces or pelicans. Under the care of the *Compañía Administradora del Guano*, this great colony is one of the leading producers of nitrogen-rich fertilizer.

Research Projects Started in 1935

In the United States the cooperative research projects and the Federal Aid Act provide concrete evidence of the interest in maintaining a shootable surplus of game birds and mammals.

The research projects were inaugurated in 1935 and are financed by allotment of funds from the Fish and Wildlife Service, the Land Grant Colleges, the State Game Departments, and the American Wildlife Institute. Eleven have been in operation. They are located in Virginia, Oregon, Iowa, Connecticut, Alabama, Utah, Texas, Maine, Ohio, Missouri, and Pennsylvania. The unit in Connecticut was terminated, however, after 3 years. They have functioned in the fields of research, demonstration, and education, each unit being organized with an administrative committee composed of representatives from the State Game Department, the college or university which serves as the base of operations, and the Fish and Wildlife Service. A biologist of the latter organization acts as the leader in accomplishing the technical phases of the program; the assistant leader represents the college on the education and training program. Graduate students are awarded scholarships set up according to the academic requirements of the institution. A stipend of $600 to $900 a year is usual, and about half the time that is required for a 2-year course leading to a master's degree is spent on some field problem. Typical problems are those dealing with life histories, status, and management of game and fur species; land management practices dealing with improvements in wildlife habitat; protective measures for the proper conservation of these species; and methods of utilization that will maintain satisfactory populations.

In 1937 Congress enacted the Federal Aid to Wildlife Restoration Act, more commonly known as the Pittman-Robertson Act in honor of the members of Congress who introduced it in the Senate and the House of Representatives. Its purpose is to provide means for cooperating with the States on the solution of pressing wildlife problems and putting into effect wildlife-management programs. Funds are derived from the national 10 percent excise tax that is levied on sporting arms and ammunition. Collections from this tax average approximately $3,000,000 annually. Moneys appropriated are apportioned to the States—half in the ratio which the area of the State bears to the area of all the States and half in the ratio which the number of paid hunting-license holders in each State bears to the total number of paid hunting-license holders in all the States. Under the terms of the Act the United States pays not to exceed 75 percent of the cost of a project and the States must pay not less than 25 percent. A condition necessary for the participation of any State in the program is that it must assent to the act and must have enacted laws prohibiting the diversion of hunting-license money for any purpose other than the operation of the State Game and Fish Department.

The act is administered by the Fish and Wildlife Service, and any funds not used by the States during the 2-year period of availability are used to carry out the provisions of the Migratory Bird Conservation Act for the establishment of inviolate sanctuaries for migratory game birds. At the present time 46 States are actively participating in the wildlife-restoration program. The major lines of activity provided for are the acquisition and development of lands for wildlife use and research into the problems of wildlife management. A detailed statement of the projects that have been approved and completed under this program would fill many pages. Up to the present, 10½ million dollars have been appropriated for the work and more than 800 distinct projects have been approved. In addition, nearly 300 trained technicians, who are giving new

Pan American Union Photo

The rhea or American ostrich has been hunted persistently for its feathers

impetus to the development of the Nation's wildlife resources, have been added to the staffs of the State Game Departments. Many of these are graduates of the cooperative research units.

Wildlife—a Source of Food

The fact that we are now at war may prompt the feeling that wildlife conservation and restoration should be sidetracked for the duration. I do not agree. What has proved to be good management in normal times is even more important now, because the need is more pressing. For years we have been learning how to "manage" and "harvest" a wildlife crop, largely for sport. Now, at the most critical period in the history of the Western Hemisphere, the official custodians of this renewable and valuable resource should realize its importance and so manage it that it will yield a more practical service to the United Nations. While carefully watching to make sure that the important gains of the past are not sacrificed, it is possible by better management to increase the surpluses and then to encourage a wiser use.

Wildlife plays a more important part in winning and losing wars than most of us realize. Bubonic plague, the Black Death that scourged all Europe during the military campaigns of Medieval times, perhaps killed more soldiers than ever fell by the sword, the longbow, or the blunderbuss. Rodent-borne typhus is now prevalent in parts of Europe and will have a definite influence on Germany's attempt to subjugate all that continent.

Remember, too, the part played by furs in modern war. Last winter the Russians were able to turn the tables on the Germans, who did not know the dangers of 50° and 60° below zero in clothing unsuited for such weather. Furs undoubtedly played an important part in this campaign.

American sportsmen do not enjoy being known as "meat hunters" but prefer to recognize only the recreational value of the sport. Nevertheless, wildlife does contribute considerably to the national supply of meat. For example, every pheasant, wild duck, or grouse replaces a chicken that can be sent to our armed forces or to our Allies, and every deer supplies venison to replace other meat for the family larder. Each year, in the United States, more than 900,000 big-game animals are killed, including deer, elk, moose, and antelope. At an average of only 90 pounds dressed weight (a most conservative figure) this represents about 81,000,000 pounds of meat. During the last year approximately 15,000,000 waterfowl, 20,000,000 rabbits, 15,000,000 upland-game birds, and more than 4,000,000 other small-game animals were killed. Again, using an ultraconservative figure of only 1 pound each when dressed, we have the astounding figure of an additional 54,000,000 pounds of protein-rich food. This makes a total of at least 135,000,000 pounds of meat in game birds and mammals, to which should be added the game fishes.

There are more than 12,000,000 sport fishermen in the United States. Conservative estimates are that each of them will catch, on the average, more than 25 pounds of fish each year, and in many States the average catch is above 30 pounds. In California, for example, it is known to be in excess of 50 pounds per sport fisherman. Even on the basis of the 25-pound average there is an annual catch of 300,000,000 pounds of game fish. Altogether, this take by sportsmen adds up to 435,000,000 pounds of food that becomes available each year from the harvest of game birds, game mammals, and game fish.

According to the Quartermaster Corps of the United States Army, the 435,000,000 pounds of wild game and game fish that each year is used in American homes would replace enough beef, pork, poultry, commercial fish, and other meat to feed an army of 700,000 soldiers 1 pound per day for an entire year.

These startling figures show why wildlife administrators must be on guard to prevent exploitation of the resource. As in most wars, a food shortage existed during the first World War, resulting in a strong demand for liberalization of game laws so that wildlife could be immediately utilized in large quantities.

Vigilance Required

The forces of conservation will always have to fight against taking the last fish, killing the last duck or the last deer, or cutting down the last tree. It is the duty of those charged with wildlife preservation and of all those concerned with the national welfare to see that such action is taken. In conservation, as in a war, we may win many battles but if we lose the last one we lose the war.

In conclusion, reference is again made to the North American migratory-waterfowl program. Fundamentally, the high degree of success in this undertaking was due to facts obtained by thorough investigation and research. Hunting regulations, for example, are based annually on the results of year-round studies. Not only is careful analysis made of the reports of cooperating observers and a large staff of field agents, but, in addition, a small group of trained biologists virtually "live with the birds," following them north to their breeding grounds even to the Arctic coast and back again to their wintering grounds in the southern United States and in Mexico.

If such success can be achieved in the management of the migratory birds that are at home during some part of the year in several countries of the Western Hemisphere, surely we can, all of us, do an equally good job in managing the wildlife resources that are resident in parts of our respective countries.

ALONG THE *Agricultural Front*

▲ Food Production Increased in Northern Brazil

In the first year following the Brazilian-United States agreement for a 2-year food-development program in northern Brazil, heartening results have been obtained. Under this agreement, signed in September 1942, some 213,000 additional acres were planted to food crops, the production from which included 19 million pounds of rice, 238 million pounds of corn, and 84 million pounds of beans—all important items of food in Brazil. All of this increased production is for local consumption. A considerable portion of the increase can be attributed to emergency activities of the Brazilian *Secção do Fomento*, ably assisted by the Food Supply Division of the Office of the Coordinator of Inter-American Affairs.

Through this production program the northern areas of Brazil are becoming increasingly self-sufficient in food. Also, faciltiies for storing food surpluses in time of abundance for use in periods of scarcity are planned as one means of solving the food problem in areas formerly dependent upon imports. More than 500 silos have been installed toward a goal of 1,200, in 12 of Brazil's northern states.

▲Haiti to Produce Derris for U. S. Market

Derris cuttings, 100,000 of them, have been planted in Haiti under an agreement between Haiti and the Commodity Credit Corporation. Under this agreement, the United States will get the entire production. Before the war large quantities of rotenone, the powerful insecticide derived from derris roots, came from Malaya.

The cuttings were shipped to Haiti from the United States Department of Agriculture's experiment station in Mayagüez, Puerto Rico. The Haitian Department of Agriculture determined where the cuttings would grow satisfactorily and then distributed them to small farmers. Two years are required from planting to production.

Cuttings from the Mayagüez station have also been flown to Mexico and to Central and South America. Mexico has some 60,000 rooted plants, while the six republics composing Central America have slightly over a million. The goal is to have 1½ million cuttings planted in Central America and Mexico by spring. Colombia, Ecuador, and Peru are also interested in producing this plant. Among them they have over 400,000 plants, and the numbers are increasing.

▲Crop Diversification in Nicaragua

To help supply war needs, Nicaragua has been expanding production of comparatively new crops and in so doing is improving its prospects for sound crop diversification. Hevea rubber trees, derris plants to make insecticides, roselle fiber and abacá (source of Manila hemp), sesame for oils, cryptostegia for rubber, and cinchona for quinine are among the new crops being tried.

In Nicaragua's Pacific coast area, where sugarcane, coffee, cotton, corn, upland rice, tobacco, dairy cattle, and cheese are the leading products, plows and oxen are being replaced to some extent by tractors and other mechanical equipment. The country is also making a substantial contribution to the war with mahogany logs, which are used in the construction of PT boats and for many other purposes. This valuable lumber comes from the woodlands of the east coast.

▲Central America Growing More Food for Home Use

In the days before shipping was such a problem, bananas and coffee for export used to be the principal crops of the Central American countries. Now the governments are turning their attention to growing more subsistence crops and to improving livestock. From Costa Rica, Panama, Nicaragua, El Salvador, and Honduras have come reports of plans, some of them already materializing, for an extensive program which includes the utilization of thousands of acres for agricultural expansion; more efficient use of water supply; soil conservation and irrigation; improvement of transportation and storage facilities; and, perhaps most important of all, the furnishing of small loans, seed, insecticides, and equipment to farmers.

▲Citronella Grass Planted at Nicaraguan Nursery

Several clumps of citronella grass (*Cymbopogon nardus*) from the north coast of Honduras have been planted at the Nicaraguan Government nursery at Masetepe and at the United States-Nicaraguan complementary-crop experiment station near El Recreo. As soon as propagation stocks are available, clumps of the citronella will be distributed to persons interested in growing it. No appreciable amount of citronella is expected to be available for export in the near future, however, because this plant was brought to Nicaragua only a few months ago. The United States formerly imported about 99 percent of its supply of citronella oil from areas now overrun by Japan.

AGRICULTURE IN THE AMERICAS STANLEY H. GAINES, EDITOR

A monthly publication of the Office of Foreign Agricultural Relations of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents per copy, or by subscription at the rate of 75 cents per year, domestic; $1.20 per year, foreign. Postage stamps will not be accepted in payment.

▲Hemisphere Cinchona Production Actively Encouraged

Prior to the present war, little was heard of the cinchona plant, although few people failed to have need at some time in their lives of quinine—a product of cinchona bark. The United States Department of Agriculture has, however, interested itself for the past 12 years in encouraging cinchona production to assure a supply of quinine in the Western Hemisphere. Even before the war, Brazil, Mexico, and Guatemala were supplied with good-quality planting stock of cinchona. Good stock was planted by the Office of Experiment Stations on United States soil in Puerto Rico as early as 1932. Since then research work has been carried on there to determine the best methods to be used in propagating such stock. Seedlings have been produced satisfactorily, studies in breeding important forms of cinchona has been made, and a method of grafting cinchona on stocks of more sturdy native species has been developed. At the same time the Bureau of Plant Industry, Soils and Agricultural Engineering has conducted investigations in propagation. Now, little difficulty is experienced in producing cinchona seedlings, which have been shipped to planters in Brazil, Ecuador, El Salvador, Guatemala, Nicaragua, Peru, Mexico, and the Canal Zone.

Since 1939, the Office of Foreign Agricultural Relations has made arrangements whereby the United States Government and the Governments of Peru, Bolivia, Ecuador, El Salvador, and Nicaragua are now actively collaborating in encouraging cinchona production. This includes research work and the use of improved techniques.

Over 100,000 cinchona plants have been sent from the Department of Agriculture's greenhouses to experiment stations in Ecuador, El Salvador, Nicaragua, and Peru. In addition, the stations in Ecuador and Peru have established cinchona nurseries and are growing seedlings for commercial plantings. Technical personnel, botanists, and foresters have been supplied by the United States Government for exploration work. Investigations of the possibilities of cinchona production in Costa Rica have been made, and the services of a soil scientist who had experience with cinchona soil requirements in the Philippine Islands were supplied. Two cinchona pathologists spent some time in Guatemala and made recommendations regarding the combating of certain diseases in that country. They are now studying the diseases attacking cinchona plantings in Bolivia.

▲Cuba's Food Congress Adopts Resolutions

Twenty-four resolutions and recommendations were adopted at Cuba's First Food Congress. Those having to do with Agriculture are as follows: Regulation and supervision of the sanitary aspects of the milk industry; appointment of a General Director of Livestock in the Ministry of Agriculture; encouragement of construction and installation of refrigerating plants in the principal zones of agricultural production; protection of farmers against the effects of prolonged droughts, hurricanes, floods, etc.; creation of a National Agricultural Bank, the capital of which should be contributed by the Government; and enactment of a law to regulate the operation of agricultural cooperatives.

▲Chile's Quillay "Soapbark" Industry

Quillay, or soapbark, is considered, in wartime, one of the best nonanimal substances used for cleaning lenses and precision instruments. In peacetime it is a shampoo base.

The bark comes from the quillay tree, which grows wild on the Andean slopes of the northern and central zones of Chile. There are probably more than 100,000 of these trees. The people of Chile go up into the mountains and strip the bark from the larger ones. It is then baled for shipment.

In 1942 Chile's exports of quillay were valued at about $17,800. The United States is one of the foremost markets for this product.

▲Nicaragua Experiments With Peanut Production

Nicaragua has not up to this time produced peanuts commercially. The farmers have not been familiar with the methods of large-scale production or the problems of harvesting. But, because they believe there is a market for this crop in the United States, Nicaraguans are now displaying considerable interest in the growing of peanuts.

Accordingly, 10 tons of Spanish-type peanuts and 0.5 tons of "runners" from the United States were delivered to the National Bank of Nicaragua, which in turn made them available to the planters in the Leon and Chinandega areas.

Those interested in the peanut experiment planned a trial planting of 300 or 400 acres for this year, but if a production contract could be consummated with the United States they hoped to increase the acreage planted for 1944 sufficiently to pro- they hoped to increase the acreage planted for 1944 sufficiently to provide a surplus for export. Plantings are made in August, and the crop is harvested in November. Cleaning can be done with the equipment used for sesame.

▲Cuba to Try Raising Rabbits

Cuba is experimenting with the raising of rabbits in order to supplement the domestic meat supply and to promote the diversification of its agriculture. The Minister of Agriculture has issued a decree permitting for a period of 2 years the free importation of some 30 specified breeds. Rabbit raising by owners of small farms is to be encouraged, and a sum of $1,907 will be made available for carrying on the project.

Rabbits are not indigenous to Cuba, and climatic conditions of temperatute and humidity may necessitate control measures too elaborate to make the undertaking a success. Care will also be needed to prevent them from escaping captivity.

▲New Federal Territories Created in Brazil

President Getulio Vargas of Brazil has signed a decree creating five Federal territories out of parts of the States of Pará, Amazonas, Mato Grosso, Paraná, and Santa Catharina. The new territories, rich in natural resources, lie on Brazil's frontiers and will be known as Amapá, Rio Branco, Guapore, Ponta Pora, and Iguassú.

GUATEMALA

Land

Guatemala, the northernmost Republic of Central America, is about equal in size to the State of Ohio. Across the northern boundary is Mexico, and on the south and southeast are El Salvador and Honduras. At the extreme northeast, British Honduras takes out a corner along the eastern side of the State of Petén, leaving Guatemala, on the Atlantic side, only a short stretch of coast. Most of its coast line—200 miles—is on the Pacific side.

Parallel with the Pacific, Guatemala is traversed from north to south by a mountain range known as the Cordillera of the Andes, a range belonging to the Antillean system rather than to the South American Andean system. Between the mountains and the ocean is a narrow strip of foothills and lowland plains.

Climate

The coastal plains on both the Atlantic and Pacific sides have a tropical climate, but the interior highlands are temperate. On some of the higher mountains the temperature drops below freezing. Although the rainy season, from May to December, is general throughout the country, the rainfall varies from 137 inches a year on the north coast to 62 inches on the south.

The People

The population according to the 1940 estimate was approximately 3.3 million, of which 55 percent were Indians. Of the 44 percent listed as white and mestizo, the majority are mestizo. The people are concentrated largely in the highlands, most of the Indians living in small villages on the plateaus and the whites in the capital city. Comparatively few people live in the northern State of Petén.

Agriculture

Guatemala's soils are fertile, and agriculture is the predominant industry, in spite of the fact that only 10 percent of the total area is cultivated either in crops or planted pastures. Most of the domestic food requirements—corn, which is the principal item of diet, beans, panela (brown sugar), yuca, rice, potatoes, other vegetables, and fruit—are produced at home. Coffee and bananas are raised for export. Wheat flour, fats, and oils are the only important foods that are imported.

The meat requirements, too, are met by domestic livestock. Escuintla, in the western part, is the most important cattle-producing section. Sheep are concentrated in the highlands, but hogs are produced throughout the country.

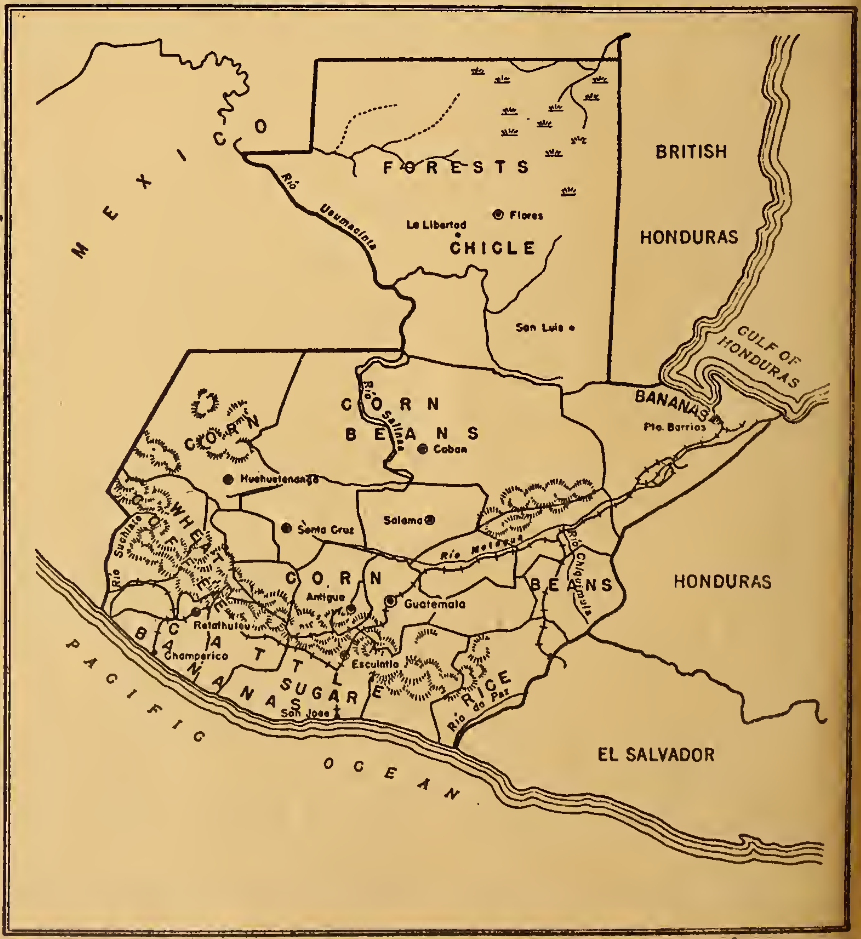
Cinchona (source of quinine), although it represents a small proportion of Guatemala's agricultural industry, has been more widely planted in that country than elsewhere in this hemisphere.

Exports

Guatemala exports both agricultural and forest products. Coffee and bananas account for about nine-tenths of the total export value. Coffee grows in the mountain valleys and on the hillsides, principally in San Marcos, Quezaltenango, and Suchitepéquez.

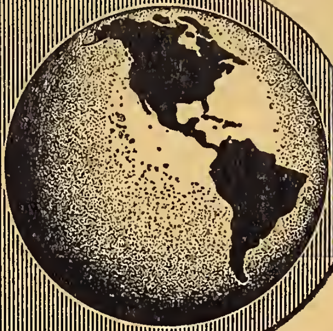
Chicle, the third most valuable export, is produced on government-owned lands in the State of Petén between Mexico and British Honduras.

Guatemalan mahogany is famous. Other woods well known in trade are cedar, primavera (white mahogany), lignum vitae, pine, ceiba (source of kapok), mora, cenizo, and balsam. Cinchona bark (quinine), rubber, and palm nuts are becoming increasingly important exports.



84

Agriculture IN THE Americas



Issued Monthly by the OFFICE OF FOREIGN AGRICULTURAL RELATIONS
UNITED STATES DEPARTMENT OF AGRICULTURE

IN THIS ISSUE

PAGE
Extension Work at Tingo María 23
Soft Fiber From Roselle 27
Agricultural Museum in Peru 30
Dairying in Nicaragua 33
Along the Agricultural Front 37
Gifts of the Americas—The Pineapple 39

February 1944

NAMES & NEWS

Agricultural Assignments

Benjamin Y. Morrison, of the Office of Foreign Agricultural Relations, is in Colombia, where he is assisting in the coordination of the agricultural research program in that country, especially as it relates to the production of cinchona. He will collaborate with the proposed development corporation, the Caja de Crédito Agrario Industrial y Minero, and the Ministry of National Economy as a consultant on research related to agriculture wherever such work is carried on by the Colombian Government.

En route to Colombia Mr. Morrison stopped in Guatemala to inspect plantings of cinchona; in El Salvador to confer with the staff of the Cooperative Agricultural Experiment Station with reference to further plantings of cinchona and related plants; in Costa Rica to confer with Colonel Fischer, Executive Director of the American Cinchona Plantation; and in Panama, where a number of valuable clones of plants important to the complementary-products program are being grown.

Edward L. Tanner, of the Office of Foreign Agricultural Relations, has been assigned to the Cooperative Experiment Station in Nicaragua to conduct agronomic work on coconuts, sesame, and other oil-yielding plants, on rice, and on abacá, a source of fiber. A phase of his work will be to establish demonstration plantings on private farms and to assist in training Nicaraguan personnel at the Station.

Forest Resources in Chile

Five forestry specialists of the Forest Service in the U. S. Department of Agriculture are in Chile to aid that country in a study of its forest resources and possibilities for expansion of its wood-utilization industry. The project is being carried out under an agreement between the Forest Service and the Corporación de Fomento de la Producción, an agency of the Chilean Government, which will finance the project. The work will include field surveys to determine the extent and character of the forests of Chile, studies of logging methods and costs, and of timber species of potential commercial value. It may be desirable to make further tests of Chilean timber species, including their pulping qualities, at the Forest Products Laboratory in Madison, Wisconsin.

Dr. I. T. Haig, Chief of the Division of Forest Management Research, has general charge of the project. Others in the mission are *Philip Briegleb* of the Pacific Northwest Forest Experiment Station, *Burnett Payne* of the North Pacific Region, *Lawrence V. Teesdale* of the Forest Products Laboratory, and *Dr. M. L. Haertel,* consulting technician on the wood chemical distillation industry.

The forestry mission is one of several being sent to Chile under the auspices of the Corporación de Fomento de la Producción, with the general objective of broadening Chile's industrial base and furnishing additional employment.

Señor Emilio Pinel, Professor of Physics at the University of Honduras and Professor of Agriculture at the Tegucigalpa High School, is in the United States as the guest of the Institute of Inter-American Affairs to study the organization of Field Centers of the U. S. Department of Agriculture. Upon his return to Honduras, Señor Pinel will assume his new duties as Director of Agriculture.

Agriculture IN THE *Americas*

Vol. IV • FEBRUARY 1944 • *No.* 2

Extension Work at Tingo María

Near the Cooperative Experiment Station at Tingo María, Peru, a group of small farmers are trying new crops and new methods of farming. Their success may depend on the effectiveness of agricultural extension work

by CHARLES P. LOOMIS

The success or failure of the American Republics to produce in sufficient quantities those crops that are mutually advantageous to all will hinge in no small degree upon the small farmers in the areas near the cooperative experiment stations now being established in Latin America. As the neighboring experiment stations develop better production methods and improved varieties of such vital products as cinchona, rubber, and cubé, these farmers will have to be relied upon to produce these crops in increasing quantities if the goal of the complementary-crops program is to be realized.

Because the ultimate success of the program and the work at the Tingo María Station depends heavily upon the cooperation of the farmers in the adjoining area, the Office of Foreign Agricultural Relations sent the author to Tingo María in July 1943 to make a study of the general social and agricultural background of these farmers. This article tells about some of the things I learned that have a direct bearing upon agricultural development and achievement of complementary-crop production.

The fact should be borne in mind that the small farmers about whom this article is written are colonist newcomers to the Tingo María area, sent there under a colonization project of the Peruvian Government. Being new to the area, these colonists, like colonists anywhere, will progress in keeping with the amount of knowledge and technical advice that is available to them. Supplying this information will be the job of the extension agent.

Perhaps you have heard of the farmer who, when pressed by a book salesman to buy a book on better farming methods, refused, saying: "I already know how to farm 100 percent better than I now farm. Why increase the percentage?" Fortunately, this attitude is not typical of the Tingo María colonists, who are venturing agricultural conquest over a country with unfamiliar climate, flora, and fauna. On the contrary, they are quite willing to accept advice and may even respect what some folks are inclined to call "book learnin'."

With access to proper and adequate advice they can make a valuable contribution to the complementary-crops program. The crops and livestock necessary to improve their diet can be grown locally, and the land and climate are conducive to the production of strategic crops which the United States needs but does not produce. Particularly fortunate is the fact that the majority of these colonists want to know more about improved farming and what crops can be grown to advantage.

Of 58 colonists interviewed at Tingo María, all but 2 wanted reading material on agricultural problems. Seven out of 41 expressed the opinion that technical assistance and advice were most needed for the success of the project. From the results of these interviews among the small holders we should not expect these colonists to abandon at once their usual farming practices and do exactly what the extension specialist advises. We can assume, however, that there is a positive desire for technical advice and information. This is very important to the extension agent entering a new territory.

The subjects about which the colonists want more information, in the order of frequency with which they were mentioned, are cattle, fruit, coca, general agriculture, coffee, cubé, poultry, and rice. Among the more important crops grown by the colonists for local consump-

Dr. Loomis is a staff member of the Division of Farm Population and Rural Welfare, Bureau of Agricultural Economics, and has been loaned to the Office of Foreign Agricultural Relations, in charge of rural organization and extension. An article by Ross E. Moore on the establishment of the Cooperative Experiment Station at Tingo María, Peru, appeared in the June issue of AGRICULTURE IN THE AMERICAS.

tion are tobacco, rice, bananas, coca, corn, papayas, pineapples, avocados, lemons, oranges, cassava, and coffee. Livestock includes milk and beef cattle, hogs, sheep, goats, poultry, and guinea pigs.

Livestock Problems

Only a few of the colonists at Tingo María have cattle, but practically all want at least 1 milk cow. About one-third of those who want milk cows want at least 3, and 1 wants as many as 18. They all believe they can make money by producing dairy products for the local or nearby market, and several said it would lessen their work if they could let large portions of their holdings grow up to grass and forage.

In order for the extension representative to give proper advice about dairy production at Tingo María he should know as much as possible about the dairy industry in the Tropics. One of his first tasks should be to appraise the domestic dairy-products market.

The Tingo María Experiment Station has emphasized the development of a breed of beef cattle that can be produced successfully in this particular area for local consumption, but few of the small holders in the colony want beef cattle. A survey showed that nearly 85 percent wanted more milk cows and less than 3 percent wanted more beef cows. Thus the extension specialist might have to advise against overstocking with commercial dairy cattle and, on the other hand, advise the Station to develop better milk cows for family use. There is little agreement among the colonists concerning the best breeds, feeds, and methods of handling milk cows, all of which adds to the problems with which the extension agent must deal.

Next to milk cows the animals in which the colonists are most interested are hogs. Forty-seven percent of the small holders now have one or more hogs, and about this same percentage expressed themselves as wanting more of them. To meet the desires of the colonists and to make practical use of their past experience, the experiment station and the extension specialist must find or develop varieties of hogs suitable to the montaña and demonstrate proper care of them. With improved feeding practices, hundreds of pounds of fruits and vegetables usually wasted for lack of markets could be used to feed hogs inexpensively and to supplement regular pasture.

The Tingo María colonists are also much interested in increasing their poultry flocks. Nearly all of them now have chickens and a great majority of them said they would like to have more; about half of them now have ducks and most of them want more; some, but relatively few, now have geese, turkeys, and pigeons but a large percentage want to increase their possessions of these fowl, all of which seem to thrive in the colony. It is important, therefore, that the extension agent learn about poultry diseases, feeds, including insects, that can be supplied locally, and varieties of poultry that are best adapted to this particular area. There is great interest in purebred chickens, especially breeds developed in Europe and the United States. Whether these will do as well as improved native stocks has not yet been determined.

This colonist proudly displays a good beef animal, a cross between an imported purebred bull at the experiment station and a native *Criolla* cow

Farming Practices

Most of the colonists have handled oxen, and a considerable number of them want to use oxen to pull plows as soon as the stumpage on their farming units has sufficiently disintegrated. The question of whether to use plows or not to use plows is a serious one and presents a problem to which the extension agent and experiment station staff will have to give serious consideration.

By some it is claimed that plowing, in this area of heavy rainfall and warm moist climate, may lead to rapid leaching and decomposition of essential soil elements. No doubt a system of crop rotation will have to be established that will minimize leaching and decomposition. In the Tropics it is quite customary that the cultivated land used each year—that is, the nontree, nonpasture areas—is not much more than one-tenth of the total. Obviously the continuation of this practice would not be practical on the small units of the montaña or east slopes of the Andes.

Among the colonists there is little agreement as to the proper use of the soil or its durability. If used as at present, some believe this soil will retain its fertility indefinitely; others think fertilizer must be used sometime in the reasonably near future. In reply to questions as to how soon that time might be, the answers of those who thought fertilizer would be needed indicated a range of from 3 to 20 years. The fact perhaps is that the fertility of intensively used soils at Tingo María will, in a relatively short time, be taken out by the heat and rain in much the same manner as intensive farming depleted fertility and exposed the soil to wind and drought in the Western Plains of the United States. Since the majority of the

Tingo María colonists came from areas where agricultural methods are very different from those of the montaña, their attitudes toward and knowledge concerning the use of the soil arouse apprehension as to their desire or ability to conserve it.

The average-sized unit at Tingo María is less than 13 hactares (about 35 acres). The extension agent who must deal with the colonists' production problems will have to use his influence to achieve balanced production; that is, a proper balance between soil-depleting and soil-building crops. Otherwise, as soil fertility vanishes they will either have to use fertilizer or turn to a more extensive type of agriculture based more on tree crops. The "strip and burn system," so common in the rain forests of the world, which allows depleted land to return to second growth after a short period of cropping, hardly seems practical for such small units so far from markets.

The extension agent will certainly have to deal with this problem of soil fertility very soon, judging from experience elsewhere. In a tropical climate soil deterioration is much more rapid than in a temperate climate. Maintaining soil fertility, therefore, threatens to be most important and most difficult at Tingo María. About two-thirds of their land now remains to be cleared, and practically all colonists intend to clear most of this as soon as possible. Perhaps the experience of the Franciscan Friars in the Peruvian colony at Oxapampa will be useful. These Friars, having only a small acreage of land, have carried on intensive gardening for 10 years by the use of manure and compost while other colonists in surrounding areas have been relying on that great waster of land, the strip and burn system, to replenish necessary elements.

Two Kinds of People

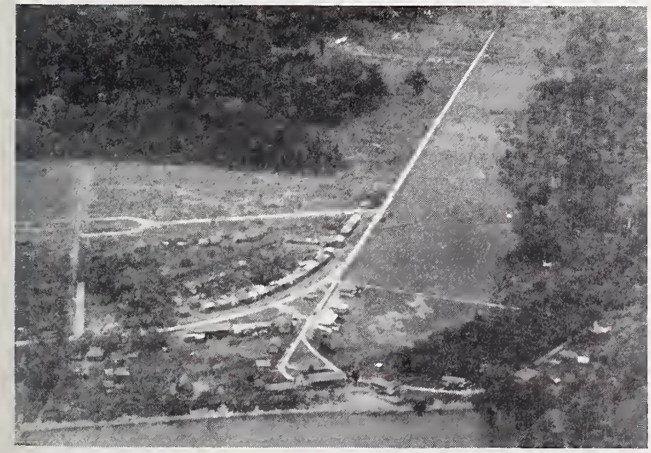
The extension agent who works among the small holders at Tingo María will not only find differences of opinion to contend with among the colonists concerning soil use, animal and plant varieties, and the like, but he will be working with two basically different groups of human beings. The people living in the farming community west of Tingo María, called Community B, and those living east of the town, called Community A, or Naranjilla, represent two very different cultures. Those living in Community B are for the most part from the mountain region about Huánaco and represent the Indian culture of the Andes of South America; those in Community A are almost all former tenants and workmen from the haciendas of the coastal valleys near Lima and represent Spanish culture.

Community differences that are important to the extension specialist are differences in desires and the background out of which these desires grew. About 20 percent of the colonists in Community B reported having reading material on agriculture, as compared with 64 percent for Naranjilla or Community A. Only one-fourth of the colonists in Community B had reading material of any kind in their homes, as compared with 77 percent in Community A. The average number of school grades completed by husbands and wives interviewed were 2 and 1.8 respectively. For Community A these averages were 6 and 4 respectively. Thus, in terms of formal education, the colonists of Community B are greatly handicapped. The average cash income during 1942 for families interviewed in Community B was only about $50 as compared with $300 for Community A.

The Crop Situation

Almost two-thirds of the colonists in Community B and about a fourth of those in Community A want to grow more coca, from which cocaine is derived. Since most of the colonists in Community B use coca and have worked on coca plantations, they would naturally be interested in growing it.

With more and more colonists desiring to produce coca, the extension agent will very likely have a crop-



The village of Tingo María is the trade center for colonists of both Community A and Community B

Cubé, a most important source of insecticide, grows well at Tingo María. By increasing production of this vital crop the colonists are making a contribution to the war effort control problem on his hands. Rather than specialize on coca, the wiser choice would seem to be to balance production with other complementary crops such as natural rubber and cubé, from which an effective insecticide is derived. Planting stocks of rubber will be available this year to colonists, and it will largely be up to the extension agent to popularize the production of this vital crop.

Much experimentation with new crops and varieties is being carried on by the colonists. Most of them want to change to better cash crops and they welcome suggestions along this line. If small industries, such as oil presses, banana-flour mills, quinine-extraction plants, and alcohol stills were more readily accessible, the value per unit of weight on products which must otherwise be shipped would be materially increased. These local industries could change completely the complexion of agriculture at Tingo María. Assuming, however, that they will not be installed in the near future, the problem next in importance to that of maintaining soil fertility is the development of high-value-per-unit-of-weight crops which have high value in their raw state. At Tingo María, as in all montaña areas, high transportation costs and lack of local demand for agricultural products are limiting factors.

Extension Committees

By popular vote the colonists of each of the two communities chose committees who were to meet with the extension agent and members of the experiment station staff to discuss their problems. These committees form the channel through which the Station and extension agent can disburse seeds, planting stock, and general information concerning agricultural practices. Also, these committees will be the spokesmen for the communities. An important committee function is to bring farmer problems to experts at the experiment station for anaylsis and recommendations. This will make it possible to record the results colonists have had concerning planting time, various plants, and farming practices.

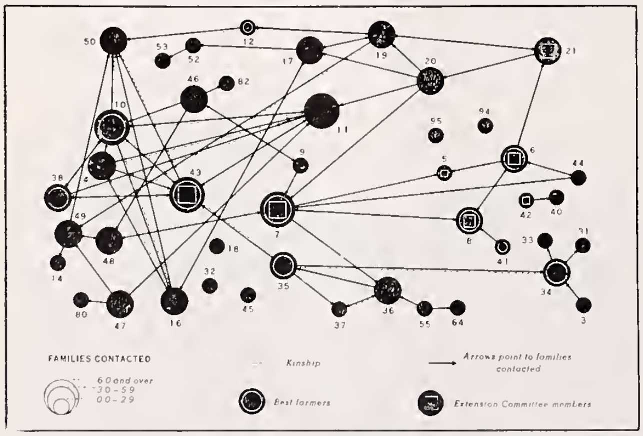
It is axiomatic in extension work that efforts to meet "felt" needs of the people will yield far greater results than work which to the county agent may be more apparent than real. The democratically chosen extension committees in these farming communities will keep the extension agent in touch with the problems which the people themselves think are important. In fact, after extension work is established they may help him plan his year's work and carry part of the responsibility toward achieving certain objectives.

In any social situation there are always some people who are much more apt to be followed than others. In the Tingo María colony some good farmers are relatively isolated so far as contacts with their neighbors are concerned. Others are in key positions in the grapevine of relationships. These people can spread bad or good tidings quickly to all parts of the community just as they can demonstrate the virtues of a new plant variety or changed farming practice.

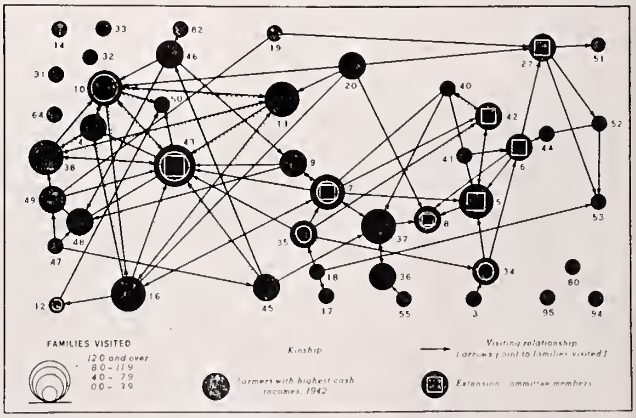
Housing Problems

Many colonists were dissatisfied with their living quarters. Since the housing problems in this area of the montaña must be solved, the opinions of the colonists concerning the choice of materials were solicited. Of course expert technical knowledge is indispensable for the development of future housing plans, but whoever must give advice concerning building materials can do so with better chances of success if he knows what the farmers think about the situation. A summary of their

(Continued on page 36)


FAMILIES CONTACTED
60 and over
30-59
00-29
Kinship
Arrows point to families contacted
Best farmers
Extension Committee members

This chart plots the mutual-aid patterns of the people in Community A. The lines indicate the flow of lending, borrowing, and exchanging work. Each family is represented by a black circle, the size of which is determined by the extent of mutual-aid activity of the particular family. The importance of this mutual aid is indicated by the fact that most of the best farmers have relatives from whom they borrow and with whom they exchange work


FAMILIES VISITED
120 and over
80-119
40-79
00-39
Kinship
Visiting relationship (arrows point to families visited)
Farmers with highest cash incomes, 1942
Extension committee members

This chart illustrates the strategic position in the grapevine of visiting relationships of the committeemen chosen by neighboring colonists, also in Community A. It is obvious from this network of relationships that the extension committee is definitely made up of key men. From these committeemen improved agricultural practices, introduced by the extension agent, may spread as rapidly as good or bad tidings

Soft Fiber From Roselle

In order to be less dependent upon foreign sources for plant fibers, production can be and is being increased in the Western Hemisphere. One of the most promising of these plants is roselle, from which a soft jute-like fiber is obtained

by JULIAN C. CRANE

Although roselle is closely related to the okra plant and is called *Hibiscus sabdariffa* by the botanists, the average person might well judge from its growth habits that it is a modern version of Jack's proverbial beanstalk. It may grow 2 inches in a day for certain growth periods, and fiber can be harvested from its 10-foot stalks 90 days after planting. This rapid growth makes roselle an extremely important soldier on the war-production front.

Since the war began, many fibers, oils and fats, insecticides, rubber products, and drugs have been classified as strategic in the war program. Accordingly, the countries of the Western Hemisphere have focused their attention upon greater production of these plant products in order to be less dependent upon outside sources. Among the most important are certain fiber-producing plants.

With many of the normal sources of supply cut off and with increased demands by industry and our armed forces for fiber products, the production of satisfactory substitutes in this hemisphere has become imperative. Curtailment of the supply of jute from India, for example, has been seriously threatened. The most promising substitute for it, to date, is perhaps roselle, from which a soft jute-like fiber is obtained. Although roselle has long been cultivated in India and on islands in the Southwest Pacific, its fiber has never reached our markets because it could not compete with the well-established jute industry.

The first roselle grown for fiber in the Western Hemisphere, the seed of which came from the Philippine Islands, was cultivated at the Cuban Agricultural Experiment Station in 1919. Later, seeds were taken to El Salvador from the Dutch East Indies, and from this source came all the present plantings in the Western Hemisphere. Experiments are now being conducted with this plant in Cuba, Nicaragua, Guatemala, Costa Rica, Honduras, Colombia, and El Salvador in cooperation with the United States Government.

The Plant and Its Culture

Roselle is an annual plant and belongs to the *Malvaceae* family, of which cotton is the most important member from a commercial standpoint. It is closely related to okra, a plant commonly grown in the southern United States as a vegetable, and to many ornamental species, such as the Swamp or Rose Mallow. The roselle species, *Hibiscus sabdariffa*, is made up of several varieties ranging in growth habit from tall, unbranched plants to a shorter, much-branched type cultivated for its highly colored, edible, leaflike parts below the petals of the flower, which have been used in Florida and California as a substitute for cranberries. The tall unbranched plant (variety *altissima*) is a quick source of soft fiber for the manufacture of burlap, cordage, and other fibrous products because harvesting takes place 3 months after the seed is planted. Under favorable growing conditions in Cuba this plant has grown 10 feet in 90 days.

Roselle exhibits marked photoperiodism and does not flower or fruit in the temperate regions until the short-light days, regardless of the date of planting. Therefore, tropical or subtropical climates are best adapted to its production. It appears to grow well on almost any well-drained fertile soil. In Cuba little difference in growth response was noted from plants growing in red, black, or mulatto soils of about the same level of fertility. Reports indicate that roselle has grown well on decidedly acid soils in El Salvador and on alkaline soils in certain sections of Guatemala. About 20 inches of rainfall during the 3-month growing period is adequate to develop the plant.

Time of Planting Important

The time of planting roselle is one of the most important factors in its production. For fiber, it may be planted in Cuba from the beginning of the rainy season, about the latter part of April depending on local conditions, until the middle of July. Plantings made later than the middle of July begin blooming and cease vegetative activity before the crop has reached sufficient height to yield much fiber.

For seed production, the custom has been in Cuba to plant at the beginning of the rainy season. By so doing

---

Dr. Crane is stationed in Cuba, assisting with the production of fiber crops, and for the past year has given particular attention to the soft-fiber plant, roselle. He is on the staff of the Office of Foreign Agricultural Relations.

the plants do not flower until 4 or 5 months later, and the greater portion of the seed crop is high up on the plants, making harvesting more difficult. Experiments in Cuba this year, however, show that by planting about the middle of August or first of September the plants begin to bloom at almost the same time as earlier plantings, with the result that the seed is borne much nearer the ground. This facilitates harvesting. Similar observations have been made in El Salvador. Planting on or about the first of September allows the plants to grow through 2 months of sufficient rainfall followed by a dry period, during which the seed matures and can be harvested.

Roselle seed can be planted satisfactorily with machines or by hand. The comparatively high cost of labor in the Americas, however, makes hand labor uneconomical. Mechanical seeders and harvesters, therefore, will no doubt have to be relied upon if roselle is to compete with jute after the war.

At the Cuban Agricultural Experiment Station roselle has grown over 10 feet high

Roselle for fiber production, planted in 8-inch or closer drill rows, requires little or no cultivation or other care from planting to harvest. The plant is such a rank grower that it soon shades out weed competition. For seed production, however, the plants are grown farther apart, and it is usually necessary to cultivate several times to control weeds.

The Harvest

Since the seed of roselle matures progressively from the lower toward the upper portion of the plant, the best time to cut it for threshing is when the seeds at the middle of the plant are fully mature. Cutting should take place in the morning or on damp days, to minimize shattering. The common method of harvesting roselle for seed is to cut the plants with machetes and shock them in the field so that more seed will mature and cure before harvesting.

In Java the custom has been either to pull up the plants or cut them with knives at ground level. With one of the cut stalks used as a string, the plants are tied in bundles, after which the tops, leaves and all, are cut off. Here again, the slow and tedious process of harvesting roselle by hand is impractical in the Americas because of the relatively high wage rates. Experiments in Honduras showed that roselle can be cut with a power-drawn mower but a great deal of hand labor is still required in picking up, sorting, and bundling the plants. Toward eliminating this expense, trials will be made in Cuba this season to harvest roselle with an experimental binder which will cut and bundle the plants in one operation.

To thresh roselle the dried plants have been placed between two large pieces of canvas and then beaten or flailed with long poles, after which the seed has been cleaned by winnowing. In Honduras some threshing success has been achieved by running the dried plants through a rice mill, and in El Salvador a coffee-threshing machine has been used for this purpose. Under good cultural and environmental conditions 1 acre will produce a thousand pounds of seed.

The most advantageous time to harvest for highest yield and quality of fiber is a question that remains to be answered. Hemp (*Cannabis sativa*) grown in the United States is harvested when the male plants are in full bloom. According to B. B. Robinson in U. S. D. A. Farmers' Bulletin No. 1935, "Very early harvested hemp

Threshing roselle for seed in El Salvador

may produce a finer and softer fiber than that harvested later, but it is usually weaker." Fiber flax grown in the United States, in order to ensure good results in yield and quality of fiber, is harvested during the "green ripe" stage or just after full bloom. Plants harvested at this stage yield a fiber not quite so fine as that produced from plants harvested earlier, but it is stronger. Whether this is true for roselle has not been definitely established, but experiments now being conducted in Cuba are designed to answer this question.

Reports from Java, where this plant has probably been more extensively cultivated than in any other country, have been contradictory as to the best time to harvest roselle for fiber production. Recommendations vary from 3 to 4 months after planting up until the seed has fully matured. Other reports indicate that the yield progressively increases the longer the plant is allowed to grow but that there is a corresponding decrease in quality of fiber after the plants have grown for 3 months. Yields of fiber per acre have varied, depending on soil, cultural, and environmental conditions, but generally 1,000 to 1,500 pounds of fiber are produced from an acre of land.

Extracting the Fiber

There are various ways to extract fiber from the roselle stalks, all of which involve retting in water, except, of course, when decorticating machines are used. After the bundled plants have dried for 2 or 3 days in the field, they are taken to a pond, irrigation ditch, or retting tank and submerged in water for 8 or 10 days. When the bark separates easily from the central woody cylinder and the fiber washes clean, the bundles are broken open and the fiber stripped and cleaned by hand. A skilled worker cannot strip more than 80 to 100 pounds of dry clean fiber in a day.

A practice in Cuba is to run the retted stalks, while still wet, between two rollers which squeeze out the central woody cylinders. Then the fiber is shaken and beaten to remove small pieces of wood and bark.

Retted roselle stalks are dried in the sun before they are run through extracting machines

In Central America this cleaning process has been modified somewhat so that it is very similar to the process used in the United States for cleaning flax fiber. When the bundles of stalks are removed from the retting tank, they are shocked and left to dry in the sun. They are then passed between fluted rollers that revolve one above the other in opposite directions. This breaks up the central woody cylinder into little pieces. The material is then run through a beating machine, which separates the wood from the fiber leaving it quite silky and clean. Although these machines approach desired efficiency, they need considerable improvement. Their production capacity is rather low, and much of the fiber is cut and lost during processing.

Large henequen decorticators have been used successfully in Cuba to process roselle. With the use of this machine, the bundles of roselle are brought directly from the field and put through the decorticator, which scrapes away the central woody cylinder, water, and waste material from the stalks, leaving the clean fiber, which is then dried in the sun for a day. The percentage of fiber varies with the age of the plant, but in a 90-day-old roselle plant the fiber is generally about 5.0 percent of the green weight of the stalk.

Roselle fiber dries in the sun after it is decorticated

The capacity of the henequen decorticating machine has been estimated at approximately 1,500 pounds of dried fiber an hour, which would require the stalks normally produced from about three-fourths of an acre. Consequently, to keep one machine in operation would require cultivation of the plants on a large scale in order to be commercially practical. Experimental tests indicate, however, that the henequen decorticating machine

(Continued on page 32)

Agricultural Museum in Peru

The Incas of Peru practiced diversified farming and food dehydration a thousand years ago. Evidence of this is on display in the form of ceramic objects, picture writing, and preserved specimens at La Molina Experiment Station in Peru

by CARLOS F. VIVANCO

Preservation is a timely subject—especially food preservation. Thousands of housewives who last year grew gardens for the first time learned to their surprise that they, in their own homes, could preserve the produce of these gardens for use many months later. Few, perhaps, realized how simple the canning process was, despite the fact that the art of food preserving in Peru is known to be at least a thousand years old. Some of the foods preserved by the Incas of Peru from 900 to 1,000 years ago have been found in a perfect state of preservation and are on display at La Molina Museum of the Agricultural Experiment Station near Lima.

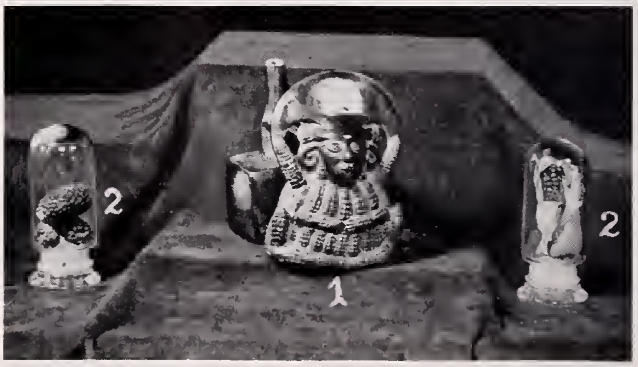
La Molina Museum is developing a sample exhibit that will portray the history of agricultural production in Peru. The basic theme is the agricultural life of the ancient Peruvians. It was they who discovered, domesticated, and used most of the food plants which, with the passing of the centuries, have constituted the most direct and valuable contribution the New World has made to our everyday lives.

Among the plants listed as having been of early Peruvian origin are 4 species of cereals, 5 of legumes, 11 tuberous-rooted plants, 30 fruit trees, 5 cucurbits and other vegetables, 3 condiments, 5 stimulants, 3 textile plants, 2 dye plants, and 12 out of many that were grown either for ornamentation, their timber or bark, or for their medicinal value. Physical evidence of the antiquity of Peruvian agricultural development exists in the display of foods found in a perfect state of preservation in the pre-Incan and Incan tombs. Ceramic objects which bear picture writing and show the structure of plants are further documentary proof of the highest early agricultural civilization on our continent.

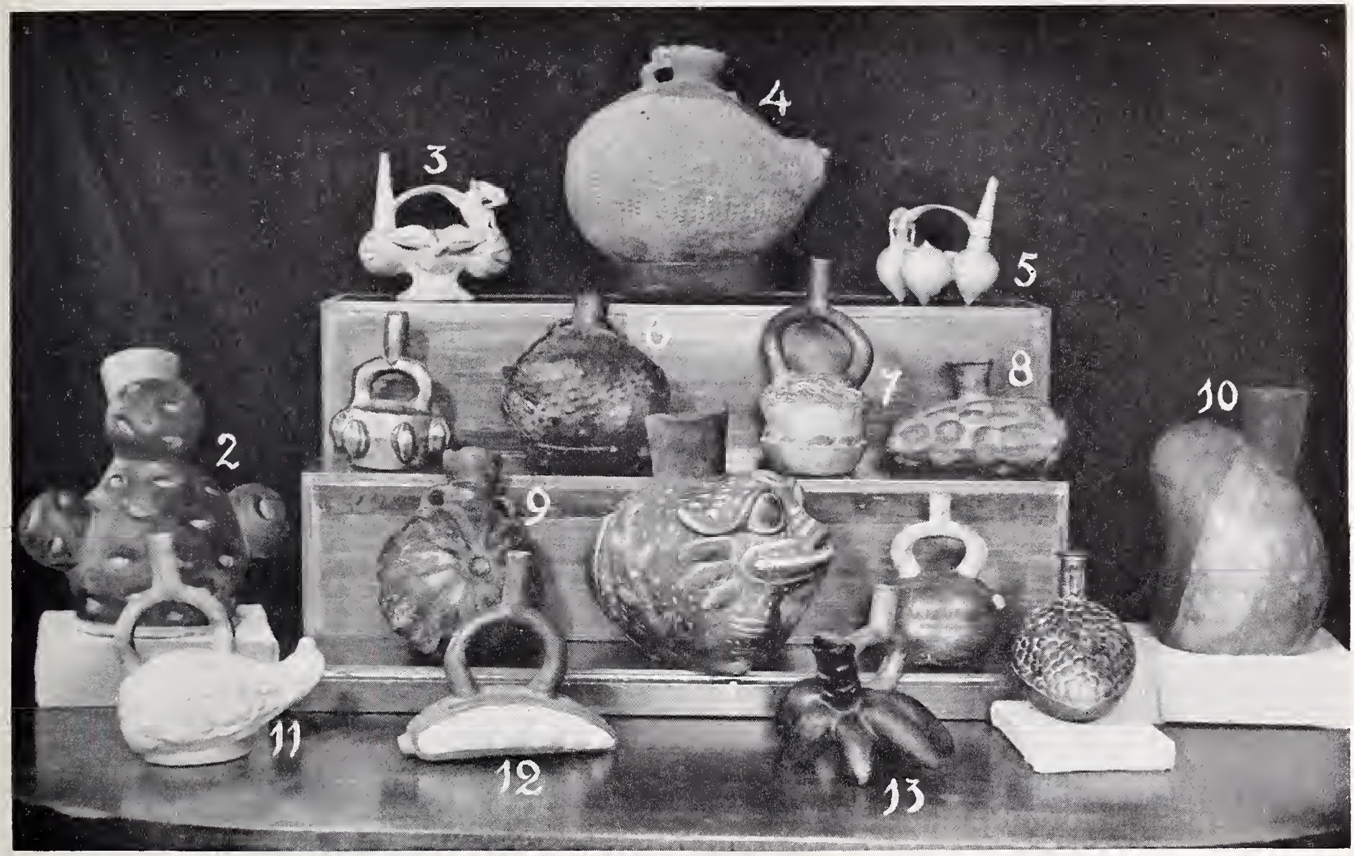
These ceramic specimens have powerful appeal because of the precise and artistic accuracy with which each product is reproduced. Examples are the potato (*Solanum andigenum*), the most authentic Peruvian plant; corn (*Zea mays*) which was so valuable to the ancient Peruvians that they identified it with the Deity in recognition of the many benefits they derived from this plant; the common cassava (*Manihot utilissima*); the lima bean (*Phaseolus lunatus*); the peanut (*Arachis hypogaea*); the sweetpotato (*Ipomoea batatas*); fruits like the pacay (*Inga feuillei*); the lucuma (*Lucuma obovata*); the pepino (*Solanum muricatum*); the soursop (*Annona muricata*); condiment products like redpeppers, the form and color of which are copied for delicate and graceful decorative motifs in Incan pottery; cucurbits and vegetables such as the cushaw and pumpkin (*Cucurbita moschata & C. pepo*); and the chayote (*Sechium edule*).

The purpose of reconstructing the agricultural life of the ancient Peruvians is not only to make known the antiquity of man's utilization of these food plants, but also to compile sources for the study and investigation of plants whose nutritive value is surprising, and which for unknown reasons have been forgotten or neglected. Unfortunately, this has happened to cereals like "quihuicha" or "achita" (*Amaranthus caudatus*), quinoa (*Chenopodium quinoa*), and "cañahua" or "cañihua" (*Chenopodium canihua*), whose wealth of proteins and fats is said to make them good food for children, sick people, and convalescents.

Interest must likewise be revived in the study of fruits which were used in abundance and were apparently much preferred by the Incas. Among these are the lucuma (*Lucuma obovata*), considered in some quarters as favorable to the fertility of women, and the pineapple (*Ananas sativus*), recommended by some for gravel and bladder diseases. Investigation should also be made to find out why the Incas found the oca (*Oxalis tuberosa*) a symbol of pleasure. The portrayal of plants and their products in ceramics and the presence of these same objects in the tombs are manifestations of the preference which the ancients gave to certain foods, the nutritive value of which they apparently understood very well.



Some corn reproductions: (1) An Incan god of agriculture; (2) specimens of corn found in pre-Incan tombs on Ocucaje plantation, Ica, Peru



Incan ceramics showing plant structure: (1) The toad, one of the gods of Incan agriculture, was considered the announcer of the rains and the bearer of good harvests; (2) the potato; (3) the pepino; (4), (9), and (11) squash and pumpkin; (5) lucumo, a tropical fruit; (6) soursop; (7) basket of peanuts; (8) the sweetpotato; (10) the lima bean; (12) pacay; and (13) the common cassava, from which tapioca is made

The Incas also knew how to preserve their foods. The dry vegetables found on the coast were buried in its sands, after being wrapped to protect them from pests. Their natural dehydration of potatoes at high altitudes above the sea level, by the combined action of frost and the heat of the sun, was advanced technique in the preservation of food. For this purpose they selected special types of potatoes whose nutritive properties were noticeably improved by preservation. Potatoes thus dehydrated were well known then and still are. The Peruvian Indians continue to carry on this practice, the processed product being called "chuno" and "moraya." Specimens of this type of dehydrated potato are exhibited in the Museum, with their corresponding analyses. Like the potato, they also dehydrated the oca and the tuber nasturtium (*Tropaeolum tuberosum*), a sweet-tasting tuber which perhaps was the "dessert" in the menu of the Incas.

Specimens found in the pre-Incan and Incan tombs make it possible to place certain products, corn for example, in periods between 1,000 and 900 years in the past. Another, and perhaps the most valuable exhibit in La Molina Museum, is the collection of farming tools made of wood, the most primitive implements thus far known.

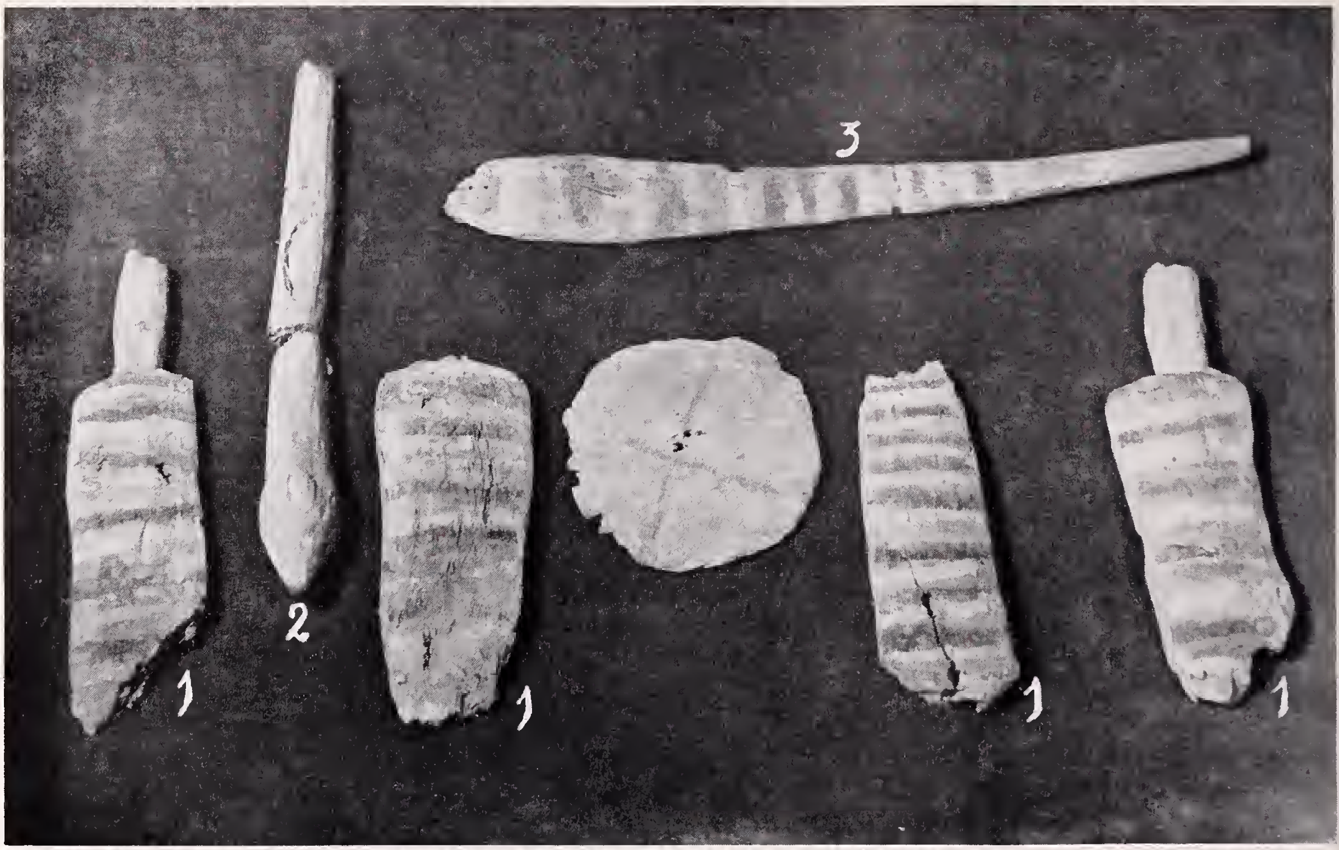
To make the agricultural history more complete, a series of drawings have been collected which were planned by the Indian, Guaman Poma de Ayala, for a book he wrote in 1587 on the agricultural life of the Incas, among other aspects of their culture. These drawings comprise a very minute and detailed agricultural calendar, indicating the months in which the various agricultural tasks were performed, such as plowing the land, cultivation, irrigation, defense against attacks by birds and insects, harvesting and storage, and the ceremonies that solemnized some of these tasks.

Among the photographs on exhibition, some of the outstanding ones are those which show the benches or terraces which the Incas built to hold the soil on the steep hillsides. In districts like the Sierra, it is unusual to find any large area of level ground.

The Incan civilization was fundamentally agricultural and was planned for the production of food. The

---

Ingeniero Vivanco, the author of this article, is curator of the museum at the Estación Experimental Agrícola La Molina, Lima, Peru.



Agricultural implements found in tombs of the ancient Peruvians: (1) A grain shovel; (2) a planting stick; and (3) the machete

Incas were ingenious in hunting for food plants, discovering their qualities, and making use of them for the benefit of their people. Every plant domesticated and cultivated by them had its use. An original example of the complete utilization of a plant is the South American lupine (*Lupinus mutabilis*), which has a seed similar to the common bean (*Phaseolus vulgaris*). These lupine seeds have an extremely bitter flavor. This can be removed by washing and soaking them in water for several days, after boiling to extract their toxic substances. The water is later used as an insecticide. Anyone who for any reason, scientific or otherwise, obtains even a superficial knowledge of the highly important work of the Incas must certainly recognize their talent and skill.

The agricultural policy of Peru today is directed toward increased food production. New centers of production and propagation are being sought in our hemisphere; new species of foods are desired; new systems of preservation are being invented; dehydration, which the Incas already knew and practiced, is a novelty. From all these angles, Peru's native crops still have much to offer our civilization. We must turn to them, sure of finding much that will be useful. To arouse that interest and exhibit the specimens of those forgotten and neglected crops is one of the purposes to which the Agricultural Museum of Peru is dedicated.

SOFT FIBER FROM ROSELLE

(Continued from page 29)

has promising possibilities for processing roselle and since the roselle harvest is of short duration each year, the production of it could well be worked into the henequen program.

Fiber obtained through retting is soft, silky, and lustrous and is of better color than jute fiber; mechanically decorticated fiber is more harsh, not so lustrous, and contains some gum but is of much better color than the retted fiber. This fiber, without degumming, has been carded and spun on jute-spinning machinery with promising results. The yarn obtained has been woven into sugar bags which are now undergoing tests in Cuban sugar mills. This fiber has also been spun experimentally on henequen-rope machines into various-sized cordage, which appears to have good quality. If roselle fiber is resistant to sea water, as reported, it may be suitable for use in many types of marine cordage.

Although the production of roselle as an agricultural industry is still in its infancy and many problems relating to its culture and processing remain to be worked out, there is little doubt that as these problems are solved roselle will play an increasingly important role in the future.

Dairying in Nicaragua

In many ways Nicaragua is naturally well suited to dairy production. This, along with improvements in breeding, feeding, and dairy management, in cooperation with the Government, is brightening the future for the Nicaraguan dairyman

by A. C. DAHLBERG

Nicaragua has three-fourths of a million head of cattle and one and a third million people, a ratio of more than one head of cattle for each two people. This is practically the same ratio as in the United States. Nicaragua leads all other republics of Central America in the total number of cattle. The livestock industry and the dairy industry are important in the agricultural economy of the country and the nutrition of the people.

The value of a sound livestock industry has long been recognized in Nicaragua, and Government officials are taking an active interest in it. Laws and regulations have been passed to encourage livestock development; the exportation of stock and the slaughter of animals are subject to regulations to maintain the cattle population; the importation of good breeding stock is encouraged; and some progress has been made toward the processing of milk and the manufacture of dairy products according to modern commercial methods. The separation of the meat industry from the dairy industry is difficult, because cattle are raised for meat, milk, and work. Generally, the same type of animal serves all three purposes and consequently is not particularly efficient in any one of them.

The dairy industry is located principally in the western tropical plains in the Departments of Chinandega, León, Managua, and Rivas. Most of the people, also, live on the Pacific coast lowlands, where the altitude ranges from 100 to 600 feet above sea level. Dairying has also developed farther inland in the Departments of Chontales, Matagalpa, and Estelí. These semitropical areas are higher and range from 1,000 to 3,500 feet above sea level. The soil of this western area is of volcanic origin and is suitable for pasture and supplemental crops. The rainfall is plentiful during the wet season but from December to April or May the pastures become parched for want of rain. The grass season is somewhat longer in the higher altitudes and the climate is appreciably cooler.

Dairy Cattle and Milk Production

The native or Criollo cattle predominate. They probably are descendants of the Andalusian cattle brought from the Iberian Peninsula by the early Spanish settlers. Their color and many other features resemble those of Jersey cattle.

Nicaraguan cows give enough milk to raise the calf and a large proportion of them are milked once a day for the first few months of lactation. The calves begin and finish each milking that is done by hand and are weaned

Moderate temperatures and a short dry season make this highland area suitable for greater dairy development naturally when the cows fail to produce milk during the dry season. The bull calves run with the cows and are castrated at approximately 2 years of age. They then become work oxen or are grown to 4 years of age for slaughter to supply beef for local consumption.

Some attempts have been made to improve the native cattle by importation of bulls of the improved dairy breeds, especially Holsteins, Jerseys, and Guernseys. In recent years some Brown Swiss bulls have been imported. Such importations have improved the quality of the cattle, but maximum results have not yet been obtained. In most instances the young native bulls have been taken from the herds to permit use of the imported bulls. Being convinced that more attention should perhaps be given to improved breeding, feeding, and management practices, some dairymen have already begun to improve their management programs. They are breeding their cattle consistently to imported bulls of the same breed, improving their feeding practices, milking twice daily, and weaning the calves soon after birth. These dairymen eventually will have a great influence on the dairy industry of Nicaragua, as a result of their practical demonstration of the value of modern dairy-herd management.

Because pasture grasses are the natural feed for cows, the value of pastures cannot be emphasized too much as a cheap source of excellent feed. In the semitropical higher lands of Nicaragua the pastures supply feed almost continuously throughout the year. In the lower lands, where most of the cattle are located, the capacity of the land to support cattle is usually limited by the pasturage available during the dry season. Since pasturage is usually inadequate, the cattle suffer from want of feed. Some dairymen do raise soiling crops, such as guinea grass, on irrigated areas, and a few have silage, but more corn and grass silage could be produced to advantage. Corn is grown extensively but it is used only for human consumption. Trench and pit silos have been demonstrated to be feasible and could be used as a means of holding feeds from the wet season for feeding in the dry season. This dry season, so far as dairy feeds are concerned, is very similar to a northern winter season.

Pastures are a problem even during the wet season. In some areas the growth of grass is so rapid for a short time that the cattle cannot consume it before it becomes old and coarse and loses much of its nutrition. As soon as dairymen can work out some system of pasture management to equalize feed supplies for their livestock during the wet and dry seasons, they will have increased milk production and have a more uniform supply throughout the year.

Calf mortality in Nicaragua is very high. Exact figures are not available but losses of 20 percent are not uncommon and in some instances the death rate is even higher. The cows freshen in the field and the calf runs with the cow as it develops to maturity unless the cow is used for milking. Irregular feedings, a warm climate, and the large cow population make the situation very favorable for cattle diseases and parasites. Some farmers, however, have already improved the handling of calves and have demonstrated that some of the methods of modern dairies can be used successfully in Nicaragua.

The cattle fever tick, which can be controlled by systematic dipping, affects the cattle at all ages, and tick fever is one of the worst cattle maladies. Internal parasites also are troublesome, their toll being greatest among calves. Mastitis is very common and sometimes the best cows become infected. Bang's disease is prevalent but tuberculosis infection is not extensive. Tests have been made to determine proper control measures for these diseases.

Milk and Milk Products

Milk production is an established enterprise on many farms. About 150,000 cows are milked and the daily production is approximately 450,000 pounds of milk, most of which is produced during the wet season.

The daily per capita milk consumption, which could well be increased, is estimated at about 5 ounces. Only about 2 ounces of this is consumed as fluid milk. Fortunately, the people of Nicaragua like cheese, because it is an excellent supplement to a diet somewhat low in milk. Milk that is not consumed as fluid milk is made into cheese or butter. The land and climate do have the potential ability to increase milk production and to maintain production more uniformly throughout the year so that the nutrition of the people may be improved.

The price of milk usually varies from 3 to 8 cents a quart. This may seem low but it is relatively high in relation to wages.

The universal practice of boiling milk just before serving it helps to safeguard the supply, but sanitary conditions generally could be improved. The cows are usually milked in open corrals, which are apt to be dusty in the dry season and muddy during the rainy weather. An effort is made to deliver milk as promptly as possible to the consumer or the milk distributor, but means of transportation are usually slow.

Managua, the capital of Nicaragua, has the only pasteurization plant in the country. This plant pasteurizes about 8,000 quarts of milk daily, most of which is bottled and sold chiefly to stores and restaurants. Home delivery is limited. The milk is inspected at the receiving room and any high-acid milk is held for buttermaking.

The author is professor of dairy industry, Cornell University, temporarily on leave as principal dairy technologist with the Bureau of Dairy Industry, U. S. Department of Agriculture.

Cattle do well on the rotationally grazed, irrigated, guinea grass pasture of the western coastal plains area of Nicaragua

During the wet season about 16,000 pounds of milk is made into cheese daily.

This pasteurization plant serves the producers and consumers of the Managua area to good advantage. The milk is inspected, pasteurized, filtered, blended to give a uniform quality, and bottled. Surplus milk is handled efficiently to bring a better market to the producers and a better cheese and butter to the consumers. This plant has been encouraged by the Government.

The predominating type of cheese is *queso blanco* (white cheese), which is made on the farm from whole milk, skim milk, or a mixture of the two. It is made from a sweet rennet curd without cooking in the whey and it is very heavily salted. The cheese is eaten fresh without curing. Some of this cheese is smoked, partially dried, and used for grating.

A limited amount of natural and processed Cheddar cheese is made on a farm near Chinandega. In Managua much of the surplus milk is pasteurized and made into a type of cheese resembling brick cheese except that it is highly salted and pressed in Cheddar molds. There are opportunities for making good cured Cheddar cheese in several sections of Nicaragua, which would probably be better than the predominating variety.

Butter is made on many farms and also at the milk plant in Managua. The farm butter is often made from cream removed from the milk that is to be used for making white cheese. The cream is churned about twice a week and is sour. The butter is generally churned too warm and does not keep well. This is not a serious problem because the practice is to consume the butter promptly after it is made. The milk plant in Managua turns out a good commercial butter made with modern equipment from pasteurized cream.

Limited Demand for Ice Cream

Ice cream is made in confectionery stores and homes, the demand for this product not yet being great enough to justify a commercial plant. The mix is made of milk and cream with corn starch and is boiled in small containers over charcoal fires. Evaporated milk, dry skim milk, and gelatin are not available. The larger freezers are 2½-gallon, ice and salt, hand freezers, but the ice cream may be hardened in mechanically refrigerated cabinets. The most common flavors are vanilla, chocolate, strawberry, and dried prune.

Nicaragua has the cattle to develop a good supply of milk, and it can produce feed for the dry season to maintain uniform milk production. As in practically all countries, the Nicaraguan people could well use more milk and milk products in their diet. This combination of facts would seem to suggest great opportunities for dairying in Nicaragua.

Reading

ABOUT THE AMERICAS

I Lived With Latin Americans, by John L. Strohm. 377 pp.; The Interstate Printers and Publishers, Danville, Ill., 1943. A chapter is devoted to each of the 20 Latin American Republics, in which the author accents the rural life of the people—their homes, their dress, their food, what they produce, and how they live generally. At the end of each chapter are brief statistics about the country as to size; the population and percentages as to color or race; the capital; products exported and imported; and pertinent data on industry and development of the country. The volume is illustrated with 152 photographs taken by the author.

Inter-American Affairs, Arthur P. Whitaker, ed. 252 pp.; Columbia University Press, New York, 1943. This book is the second volume of an annual survey covering such topics as politics, diplomacy, commerce, industry, finance, cultural relations, social welfare, public health, and labor. Various charts, statistical tables, an index, and a 27-page Inter-American chronology for 1942 add to its value as reference material.

Comisión Nacional de Irrigación. Instrucciones Provisionales sobre la Forma de Como Hacer un Levantamiento de Conservación del Suelo (National Irrigation Commission [Mexico]. Provisional Instructions for Making a Soil Conservation Survey). 36 pp.; Departamento de Conservación del Suelo, 1943. Illus.

This soil conservation survey of Mexico includes two plans. The first lists the condition of the soils in a given area with respect to conservation. It shows the type of soil erosion which exists there, the slope of the land, the kind of soil and the group to which it belongs, and the present use being made of the land, thus providing the necessary basis for planning effective erosion control and better use of the land.

The second plan shows the farmer what to raise on his land, how to maintain its fertility and prevent erosion, and what will bring him the best returns.

Latin America, by the Americana Corporation. 126 pp.; New York, 1943. Based on the latest edition of the Encyclopedia Americana. Geography, agriculture, industries, history, literature, art, social movements, international relations of Latin America, and individual accounts of the six Central American countries. Copiously illustrated.

Geography of Latin America, by Fred A. Carlson. 566 pp.; Prentice-Hall, Inc., New York, 1943. Revised edition. Discussion of each country separately with regard to national character and world relations. Added chapters on: The cultural heritage of Latin America; changes in the political pattern of Latin America; inter-American transportation; inter-continental commercial relations. Pictures, maps, tables.

Annual Report, Inter-American Institute of Agricultural Sciences. 63 pp. (mimeographed); Pan American Union, Washington, D. C., 1943. Embraces activities during fiscal year 1942–43, budget for 1943–44, future program and proposed conventions.

EXTENSION WORK AT TINGO MARÍA

(Continued from page 26)

The Tingo María colony is an experiment in housing in the Tropics. Many colonists border their walks with flowers and ornamental plants

opinions showed that the colonists think the walls of the houses which will replace those they now occupy should be made of mud, cement, brick, or other nonwood material. More specified mud than cement. Among them there seemed to be agreement that wooden structures, such as those that had been built for them, would be destroyed by insects and the weather in 10 years. Nearly all agreed that the floors should be of wood, and the supporting pillars, which in their present houses are of wood, should be of cement. Most of the colonists specified tin or asbestos roofing.

Many of the colonists in Tingo María know that the standards of housing existing where they previously lived are not applicable to the montaña in which they now live. It appears, therefore, that as soon as the housing experts design a satisfactory house for the region a housing demonstration will be in order.

With general development of agriculture in the Tingo María colony—the use of practices and plants that fit the land, climate, people, and good neighborliness—it is hoped that not only better houses but better homes will prevail.

ALONG THE *Agricultural Front*

▲ Hevea Hybrids for the Western Hemisphere

Hybrid Hevea rubber plants that promise better yields of latex and resistance to South American leaf blight are emerging from joint tests carried on in Brazil by plant breeders of the U. S. Department of Agriculture cooperating with scientists of the Brazilian Ministry of Agriculture. Hundreds of seedlings, the result of hand pollinations, are crosses between susceptible Oriental strains and the best and most resistant selections produced in earlier years on the Ford plantation in Brazil.

Five of the crosses, according to Dr. E. W. Brandes of the Agricultural Reserach Administration, have given 40 to 60 percent of seedlings that are highly resistant to the blight, are vigorous growers, and possess desirable trunk and branching qualities. He is hopeful that the breeding work will bring out commercial disease-resistant hybrids more productive than the best of the Far East.

Although these improved Hevea hybrids cannot be relied on to supply rubber for wartime use, the improvement in vigor and disease resistance does afford a better chance for re-establishing the rubber industry in its original home in the Western Hemisphere.

▲ Back-to-farm Program Under Way in Panama

A back-to-the-farm program is under way in the Republic of Panama which is designed to re-establish on farms thousands of farm laborers who migrated to the Canal Zone to work on wartime construction and whose services will no longer be needed there when construction stops.

As a part of its general agricultural program, the Panamanian Ministry of Agriculture plans to establish 20 cattle breeding and dipping stations in the Chiriqui and Los Santos provinces, where agricultural-improvement programs have been under way for some time. These 20 stations are expected by Panama to aid in its objective of producing all the meat, dairy, and poultry products needed by the Republic and the Canal Zone. Dr. Menalco Solis, Director of Panama's agricultural school and experiment station, has come to the United States to obtain breeding stock for the proposed stations, which stock will be crossed with native breeds

▲ Costa Rica Plans to Up Agricultural Production

To stimulate agricultural production and to stabilize prices for both consumers and producers, the Costa Rican Legislature is considering the creation of a 5-year fund of 1½ million colones (about $270,000) to purchase from farmers at guaranteed prices two-thirds of the country's crops of corn, beans, rice, and potatoes, according to the Office of the Coordinator of Inter-American Affairs. The fund, if created, will be administered by the Banco Nacional under the direction of the Ministers of Finance, Agriculture, and Labor.

The measure aims to establish more efficient control over food supplies by encouraging and regulating agricultural activities at the production level. The contention is that centralized production control will promote a more balanced production, and for the first time will make available statistical data on agriculture.

▲ Uruguay's Linseed Crop Hurt by Drought

Prolonged and severe drought greatly reduced the 1942-43 linseed crop in Uruguay below those of the preceding 5 years. According to figures released by the Uruguayan Ministry of Livestock and Agriculture, the area harvested was 15.7 percent less than the average for the previous 5 years, and the yield 48.2 percent smaller.

▲ Lower-Amazon Plant Has Possible Commercial Value

A valuable but as yet undeveloped plant common to the Lower Amazon Valley of Brazil is the *cauassu* (*Calathea lutea*), also locally known as *guaruma*, according to Dr. Carlos Estevao, Director of the Museu Goeldi, in Belém. This plant produces a wax on the under side of the leaf that is said to be equally as good as wax produced from the *carnauba* palm.

The *cauassu* looks something like a miniature banana tree and grows on the higher *varzea* lands throughout the State of Pará. Its leaves are extensively used for making containers with which to handle flour, sugar, and other products. In the towns they are used to wrap fresh meat. The principal advantage of *cauassu* over the *carnauba* palm is said to be that the harvest is easier. The plants grow along the edges of streams and are thus readily accessible for transportation. They are of low-growing character, so the leaves can easily be removed. As is the case with *carnauba*, however, an improved method of extracting the wax from the leaves is needed because the primitive hand method now used wastes a great deal of the product.

▲ Chile's Fourth Farm Congress Studies Post-war Problems

Chile's northern city, La Serena, was the meeting place of the Fourth Agricultural Congress late in 1943, where agrarian policy and the agricultural and forestry problems of Chile were discussed and studied by delegates from all parts of the Republic.

Inasmuch as the Third Farm Congress, held the previous year, had had as its main theme the impact of the war, the Fourth Congress took up post-war matters relating to the technical problems of agriculture; the economic system of the land; the development of agricultural production and distribution of farm products; the cooperative system; problems of a social character, such as agricultural education, social laws and labor unions, and improvement of farm-labor conditions; and the coordination of agricultural organizations.

▲ Silk Production in Espirito Santo, Brazil

Although records show that silk was produced in the State of Espirito Santo, Brazil, as early as 1880, production on an industrial scale did not begin until about 50 years later, when the Government of Espirito Santo established a Silk Culture Station at Vargem Alta. In 1930 nearly 30,000 mulberry slips were planted as a basis for silk culture. By 1938 the station had been equipped with an industrial section containing 5 looms and other necessary equipment.

Since the installation of machinery in 1938 the industry has expanded considerably. In 1942 Major João Punaro Bley, then Federal Interventor of Espirito Santo, declared that the Silk Culture Station at Vargem Alta was one of the Government's greatest realizations toward the development of the economy of the State. From 1939 to 1942 the station produced 12,890 eggs of 9 different new races of silk worms, and in 1942 over 277,000 young mulberry trees were planted by the Government of Espirito Santo.

▲ Mexico Distributes Excess Corn Supplies

On January 1, 1944, a Presidential decree became effective in Mexico under which the Consorcio, through the Nacional Distribuidora y Reguladora, S. A. de C. V., will acquire all surplus corn from excess-producing areas. The decree provides that this surplus will be distributed to deficit areas or stored for a reasonable length of time. The Mexican Government will reimburse the Consorcio for its efforts.

▲ Agricultural Census in Paraguay

A report has been received that Paraguay's Minister of Agriculture is taking an agricultural census to supplement official data on this basic phase of the country's national economy. The census is intended to determine how much of Paraguay's population is agricultural, under what conditions it works, how many workers have enough land to support themselves and their families, and how many of those who own their land have sufficient farm equipment.

▲ Labeling of Cattle Feed Required in Cuba

The Cuban Office for Regulation of Prices and Supply has issued a resolution requiring cattle feed of domestic or foreign production which is to be sold in Cuba to carry in a conspicuous place on the container a label or stamp showing the name of the product, its corresponding feed value, and purity analysis. Labels on mixed feeds must show the percentages of moisture, protein, fat, ash, and raw fiber, and the nutritive value. Unmixed feeds must be sold in their natural state and be labeled to show the name of the product.

▲ Argentina Establishes Minimum Farm Labor Wages

The Argentine Government has issued two decrees: One to reduce agricultural rents, the other to set minimum wages for farm labor. The reduced-rent decree provides for an over-all rent reduction of 20 percent, with modification in case of hardship, and fixes fines for violation of the law. The minimum-wage decree, which provides that wages for field hands will range from 5.5 to 10 pesos a day, represents the first attempt by the National Government to protect the rural day laborer.

▲ Pyrethrum From Brazil

An agreement has been completed between the Brazilian and United States Governments whereby the United States, through the Commodity Credit Corporation, will purchase Brazil's entire crop of pyrethrum flowers for insecticides, exclusive of such quantities as are needed for local consumption. This agreement will remain in effect until December 31, 1945.

▲ Wild Tomato of Peru Has Improved World Food Supply

The wild currant tomato of Peru has made a great contribution to a better world supply of food, according to plant breeders of the Agricultural Research Administration of the U. S. Department of Agriculture.

Tomato growers first realized its virtues when they found they needed help to combat fungus and bacterial causes of crop failures. In 1932 improved varieties of greenhouse tomatoes were damaged by leaf mold, but a European scientist found that the leaf mold had no damaging effect upon his wild Peruvian vines. Research in Canada, England, and the United States showed similar results.

Recently a Russian scientist found this little currant tomato highly resistant to the bacterial canker which had caused great loss in field plantings in many parts of the world. Scientists of the United States had developed varieties resistant to fusarium wilt, but sometimes under severe conditions the disease damaged the plants. Now there is a new variety, Pan American, that is virtually immune to wilt, and it got its resistance from the currant tomato.

In addition to these good qualities, this little tomato has a brilliant red color, sets fruit well in hot weather, and has two or three times as much vitamin C as most garden varieties.

▲ Retirement System for Cuban Sugar Workers

A decree creating a compulsory retirement system for all laborers in Cuba's sugar industry was signed by President Batista last November. Approximately half a million employees will be affected by the system and about 6 million dollars will be collected annually in premiums.

This retirement plan applies to all employees of the sugar, molasses, and syrup industries and includes employees of foundries whose products are 80 percent for use in the sugar industry.

AGRICULTURE IN THE AMERICAS STANLEY H. GAINES, EDITOR

A monthly publication of the Office of Foreign Agricultural Relations of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents per copy, or by subscription at the rate of 75 cents per year, domestic; $1.20 per year, foreign. Postage stamps will not be accepted in payment.

Gifts of the Americas

THE PINEAPPLE

by TRUMAN NOLD

Long before "Johnny Appleseed" became a legend for his pioneer fruit plantings in the North American wilderness, the same kind of planting spirit must have been felt among the Guarani Indians, who originally made their home in the uplands of present-day Paraguay and southern Brazil.

For the prehistoric homeland of the Guaranis had presented the tribe with a fruit, and the tribe presented it to the world. It was the original wild pineapple, a grass-like plant bearing a small fruit shaped like a pine cone, whose delectability called forth from the appreciative Indians the accolade *anana—a* signifying "fruit" in general, *nana* "excelling."

The Guaranis were no stay-at-homes and, in the course of time, they traversed the thousands of difficult miles to the Isthmus and beyond. As they pushed their conquering way northward, their "excelling" fruit advanced with them. Through Brazil, the Guianas, Venezuela, Colombia, and the Isthmus it was taken and, with the seagoing tribal offshoot known as the Caribs, participated in the invasion of the Antilles. There in the islands it met Columbus and the other navigators who followed him. The history books say that Columbus discovered the "pine of the Indies," but the fruit had come as far as he had for the meeting.

No modern manufactured article was ever introduced around the world and made a part of the life in new places with greater dispatch than this peripatetic gift of the Americas. The fruit and plants were taken aboard ship and dropped off to take root on tropical coasts wherever the winds carried those first explorers of the unknown seas.

Pineapples were growing in India as early as 1548; they took hold in other lands as far apart as the Canaries and the Philippines. This was possible because the plant is far from wholly dependent for propagation on its seeds; the crown, the stalk, and suckers readily take root, and their vitality is so persistent that rooting will take place months after the cutting is made.

The species so distributed to the far parts of the earth had, from selection and survival on the long journey of the Guaranis, already progressed a considerable distance down the road of evolution from the wild and grasslike plant in its original habitat.

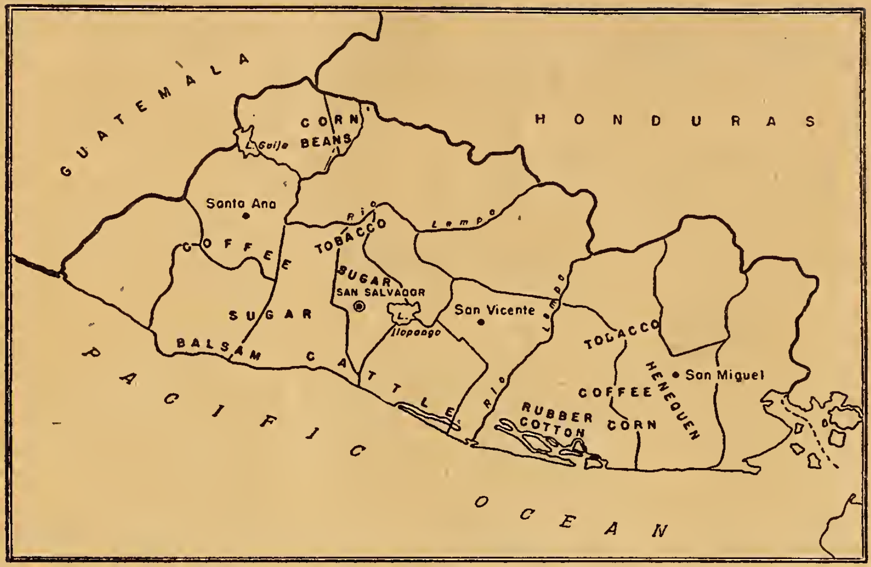
But it was in England and on the European Continent in the seventeenth and eighteenth centuries that the most rapid improvement of the pineapple toward its present-day excellence took place. The occasional specimens brought back from the Americas were so prized by the royal recipients that the interest of their gardeners was excited. These resourceful gardeners, undaunted by their own cold climate, proceeded to salvage crowns, stalks, and seeds for planting.

The construction and development of hothouses for pineapple culture became a major contribution to the art of gardening under glass. In this environment, with each plant under close scrutiny, the selection and refinement of strains was given impetus by the rivalry of gardeners to produce the best fruits.

Eventually this led to shipment back to the West Indies of improved planting stock from the English hothouses. Pineapples grown under glass in France furnished the beginnings of the industry in the Azores Islands. This same parent stock was carried on to Australia, whence in 1896 came the million plants to Hawaii from which most of the modern Hawaiian fields are derived.

Thus the "modern" role of the pineapple in horticulture and commerce is simply a worthy continuation of its history in the hands of that restless Indian tribe which brought its gift so far, to be encountered by the first Europeans to set foot on the shores of tropical America.

EL SALVADOR



When a country with a population of 1,745,000 and a total area of a little more than 13,000 square miles—about equal to the State of Maryland—is practically self-sufficient in food production, it is doing pretty well. When it not only feeds itself but exports thousands of bags of coffee in a year and produces rubber, plant fibers, and sesame to help supply vital war materials, it is doing still better. And that is what El Salvador is doing.

The Country

It is the smallest and most densely populated of all the Central or South American Republics and is the only Central American country that does not have a coast line on both oceans. There are two mountain ranges running east and west, one along the northern border, the other along the Pacific coast in the south. These ranges, which do not exceed 8,000 feet in elevation, are heavily forested, and El Salvador's principal commercial crop—coffee—flourishes on the lower slopes. Between the ranges lies a fertile plateau crossed by numerous river valleys. Land is, on the average, more intensively cultivated in El Salvador than in other Latin American countries.

The coastal regions are hot and humid, typically tropical, but in the mountains the temperature is cooler. In San Salvador, the capital city, the average temperature is from 72° to 76° F. From May through October is the rainy, or winter, season. The average annual rainfall is 72 inches.

The People

Most of the people live in the highlands and more than 60 percent of them are rural dwellers. San Salvador, however, has a population of more than 100,000.

Their Agriculture

Agriculture is by far of greater importance than any other industry in El Salvador. Out of an estimated total national production valued at slightly more than $55,000,000 in 1942 the value of agricultural production was $45,600,000.

Coffee dominates the country's economy, making up 30 percent of the total value of national production and from 85 to 95 percent of the value of all exports. While it grows in all Departments, especially in La Libertad, Usulután, Ahuachapán, and Sonsonate, one-fourth of all the coffee trees are in Santa Ana.

The second most important commercial crop is sugar. That, with rice, is exported to Honduras, and a few cattle go to Guatemala. Otherwise there are no substantial food surpluses.

Corn, beans, and rice are the dietary mainstays. Corn grows in all the Departments but it is produced in largest quantities in Santa Ana, Usulután, San Miguel, and Chalatenango. Beans grow principally in Santa Ana and La Libertad. Millet, tobacco, bananas, pineapples, coconuts, oranges, mangoes, papayas, tomatoes, and avocados are produced for home consumption.

A cattle industry of some 700,000 head provides beef and milk for local use. The industry flourishes throughout the Republic, especially in the better grazing areas of the coastal lowlands. Pigs and chickens are also found everywhere.

Many of us have supposed that balsam of Peru comes from Peru. On the contrary, the balsam tree is indigenous to El Salvador, along the coast from La Libertad to Acajutla. The balsam extracted from the tree trunk was misnamed balsam of Peru because during colonial days it was shipped to Spain by way of Peru.

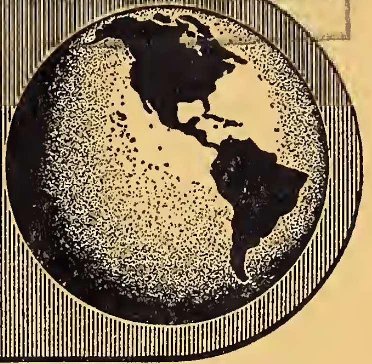
Over the past few years the Government of El Salvador has encouraged agricultural diversification and has aided in the establishment of institutions to implement its program. A cooperative credit movement was initiated in 1940, and in 1942 and 1943 several new semipublic corporations were formed to assist in the social and economic development of the country. In cooperation with the U. S. Department of Agriculture, the Government is setting up an agricultural experiment station that will serve as a focal point for agricultural development.

U. S. GOVERNMENT PRINTING OFFICE: 1944

752A
cop. 2

LIBRARY
CURRENT SERIAL RECORD
MAR 22 1944
AGRICULTURE

Agriculture in the Americas



Issued Monthly by the OFFICE OF FOREIGN AGRICULTURAL RELATIONS
UNITED STATES DEPARTMENT OF AGRICULTURE

IN THIS ISSUE

PAGE
Pearl Harbor Sent Quinine Home 43
Sheep of the Andes 46
Rural Reconstruction in Mexico 51
Hacienda Pichilingue 54
Along the Agricultural Front 57
Gifts of the Americas—Kapok 59

March 1944

NAMES & NEWS

Trainees Return to Native Countries

Miguel Balbuena, of Peru, *Ignacio Guerra,* of the Dominican Republic, and *Eduardo M. Whaite, Jr.,* of Venezuela, are three trainees of the Inter-American Trade Scholarship program who have finished their training and have returned to their respective countries to apply knowledge obtained.

Balbuena, who trained with the Federal Communications Commission in Washington and with the Southwestern Bell Telephone Company in Texas, is now general traffic superintendent of the National Telephone Company of Peru; Guerra, who studied meat packing with the Cudahy Packing Company in South Omaha, Nebraska, is now administrator of a new refrigeration and packing house at Ciudad Trujillo, Dominican Republic; and Whaite, who specialized in mechanics at the X-Cell-O Company factory in Detroit, Michigan, is now employed as a mechanic with the Venezuelan Tobacco Company.

William C. Cooper, of the Office of Foreign Agricultural Relations, has been sent to the Cooperative Experiment Station at Tingo María, Peru, where he will conduct agronomic studies in connection with the complementary-crops program. More specifically, Dr. Cooper's work will involve the extension of approved agricultural practices to farmers, the propagation and distribution of planting materials to farmers, and cooperation with other agricultural institutions of the Western Hemisphere in the furtherance of tropical agriculture.

Agricultural Assignments

R. J. Kowal, of the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, has been assigned to Barro Colorado Island in the Canal Zone to make a series of tests relative to the injection of chemicals into the sap stream of living trees to determine the effectiveness of this method to protect tropical woods from termites. This method has been used successfully on trees of the United States and is expected to be effective in the Tropics. Special interest lies in finding some means of protecting timbers being used in bridges and other structures along the Inter-American Highway.

Claud L. Horn, who is responsible for technical aspects of all agricultural research and production projects in connection with the strategic-complementary crop program of the U. S. Department of Agriculture in collaboration with the other American Republics, has gone to Peru and Ecuador, where he will review progress made at the Experiment Stations. He will also consult with Ecuadoran and Peruvian officials concerned with the program and with officials of the United States Embassy in each of the countries, relative to plans and problems of the collaborative program.

Atherton Lee, one-time director of the U. S. Department of Agriculture Experiment Station in Puerto Rico and until recently chief of the Natural Rubber Division of the War Production Board, has accepted a position with the United Fruit Company. Mr. Lee's new work will be to facilitate the introduction of new and needed crops in Middle America.

Agriculture IN THE *Americas*

Vol. IV • MARCH 1944 • *No.* 3

Pearl Harbor Sent Quinine Home

Cinchona bark is the source of quinine and, like the rubber-producing Hevea tree, is native to the Western Hemisphere. With normal sources of supply cut off by the war, good progress is being made to reestablish Latin American production of this vital commodity

by WILLIAM C. DAVIS

Today, from the intensely active Capital of the United States to the dripping rain forests of Central and South America, the word "Cinchona" is frequently heard, but its full significance is not always appreciated.

Cinchona is the Latin or scientific name of a homogeneous plant group known to scientists as a genus. Many members or species of the cinchona group, if left to grow to maturity, become towering trees, although some are no more than shrubs or bushes. From the dried bark of certain of these trees quinine is extracted. The critical need for this drug, especially in the Tropics and sub-Tropics, has been apparent for many years, but the importance of immediate availability from new sources increased a hundred-fold upon the attack of Tojo's little men on our "Paradise Islands" in the Pacific.

In addition to quinine, other alkaloids of value derived from the bark of cinchona trees are quinidine, cinchonine, and cinchonidine. A mixture of all four of these antimalarial drugs, with other extracts from the bark, constitute what is known as totaquina, a nonsynthetic product that is available to civilians for treatment of malaria. But natural products are not the only drugs used for malaria. Of the synthetic products atabrine, produced entirely in the laboratory, is proving of value in the control of this pestilence. While both natural and synthetic drugs are used in the treatment of malaria, each may be regarded as complementary to, rather than a substitute for, the other.

Native to Western Hemisphere

Cinchona is a native of the Western Hemisphere. It, like Hevea, one of the plants from which raw rubber is derived, was taken to the Eastern Hemisphere for cultivation about 1860 and developed into a profitable business enterprise. Japanese possession of Java, where this industry was chiefly centered, was a temporary victory for Tojo. The subsequent discovery, however, that the Allies can meet their needs by stimulating quinine production in the Americas gives him a bitter-pill taste that will outlast the war.

At the present time quinine supplies for the Allied Nations are being obtained in varying quantities from Guatemala, Venezuela, Colombia, Ecuador, Peru, and Bolivia. All these countries and Mexico, Costa Rica, and Brazil, together with the United States, are cooperating to make necessary studies and to develop in the Western Hemisphere a sound cinchona industry. In this hemispherical cooperative project each country is making definite contributions.

Though Mexico as a whole is farther north of the Equator than is commonly regarded as suitable for cinchona plantings, yet it does possess several promising areas. As a matter of historical interest, it may be noted that one of the first plantings to be made in North America appears to be that made in the fall of 1866 near Cordoba, Mexico. The earliest plantings north of the Equator were probably those made in 1860 in Jamaica. Progress is now being made to develop cinchona plantations in the southwest part of Mexico, in the general vicinity of Tapachula.

Current Sources of Production

The Government of Guatemala likewise has been interested in the development of cinchona production for many years and accordingly established plantations as early as 1865. Since then only a few crops of bark have

For the past year the author has carried on studies and has assisted in developing cinchona projects in the more important cinchona-producing countries of the Western Hemisphere. Mr. Davis is on the staff of the Office of Foreign Agricultural Relations. Articles on quinine which have previously appeared in AGRICULTURE IN THE AMERICAS are "Quinine From the Fever Tree" (March 1942), by Wilson Popenoe, and "Quinine From Seed" (July 1943), by B. Y. Morrison.

been taken from these plantings, but during the past year appreciable quantities of bark were harvested from this area by the United States in cooperation with the Government of Guatemala. Private plantation operators in Guatemala started a cooperative effort to make cinchona-bark production a national product in about 1934 and since that date have carried on intensive propagation and cultural studies.

Only a few days before the fall of the Philippine Islands Col. Arthur F. Fischer, on his malaria-ridden cot, realized the desperate need for getting cinchona seed to the Americas. Physically exhausted from the disease, he was able only by sheer determination of mind to accomplish the apparently impossible feat of snatching cinchona seed literally from the enemy. Stock from some of this seed has been grown by the U. S. Department of Agriculture at Glenn Dale, Md., and distributed to areas adapted to growing it. The bulk of this planting material, however, is being grown under the experienced direction of Colonel Fischer in Costa Rica.

Cinchona seedlings must be grown in shaded seedbeds before being planted in the field

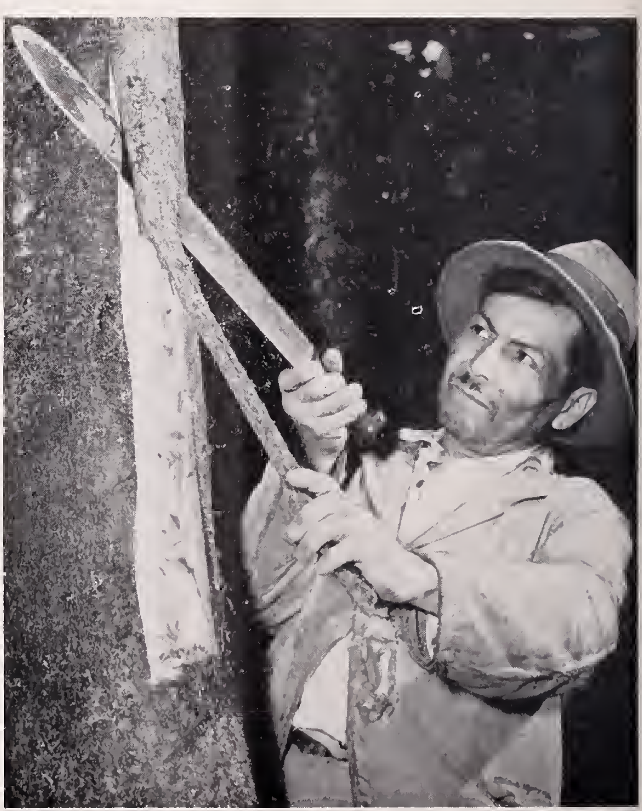
With minor exceptions, the cinchona bark now coming out of Western Hemisphere countries is from wild or native stands. During the past year Colombia has contributed more bark from native stands than any other country in this hemisphere to meet Allied needs. In Colombia, incidentally, the bark from a related plant, botanically known as *Remijia*, contains enough quinine to make its harvest profitable under existing conditions. Generally speaking, development of nurseries and plantations in Colombia is in the formative stage. However, some stock from Guatemala has been started at Chinchiná, in the west-central part of Colombia.

Ecuador is one of the earliest contributors to world needs for cinchona bark. The area of the country where intense harvest of the bark from wild trees first took place was in the southwestern part around Loja. Some years ago several plantations were established in Ecuador, but interest in the cultivation of cinchona has not been very active until recently. At the present time nursery production of seedlings and establishment of plantations are receiving strong support by the Government of Ecuador.

Peru, like Ecuador, has long supplied cinchona bark on the world markets. In the 1600's the bark of cinchona was known to Europe as "Peruvian bark," but other names in use in Europe were "Jesuits' bark" and "Cardinal's bark." At one time Peruvian bark was one of the more important exports from that country, large quantities being exported to Europe. Little effort has been made, however, until recently to cultivate this plant in Peru.

Within the last 15 years the Japanese have established nurseries and plantations in Peru, presumably using planting material they had smuggled from the Dutch plantations of Java. These holdings were expropriated by the Peruvian Government in 1943. Recent analysis shows that, regardless of true source of this stock, some of the trees on these plantations are relatively high in quinine content. This stock is now being used in a plantation project jointly sponsored by Peru and the United States.

Bolivia also is of importance from historical and production viewpoints. It is the original source of the historic cinchona-seed collections made in 1865 by Indian



Nearly all cinchona bark in the Western Hemisphere is harvested with the machete

servants of Charles Ledger, a trader, after whom the ledger form of cinchona was named. This was the parent stock of the high-quinine-yielding cinchona bark of Java that is now known as *C. officinalis*, form *ledgeriana*. The cinchona-producing areas of Bolivia are famous as the source of bark having the highest average quinine content in the Western Hemisphere. Plantations were started in Bolivia as early as 1880 but, although they were successful from a production standpoint, the drop in the price of bark shortly after 1870, coupled with transportation problems, resulted in the failure of these plantations to compete in world markets. Several million cinchona trees have been established on Bolivian plantations within the past 15 years. Bark is now being taken from some of these plantations, but the chief source continues to be from native trees scattered through the Andes in the northern part of the country.

In Brazil, cinchona production is still in the experimental stage. Small plantings have been made in the mountainous regions bordering the State of Minas Gerais. The Brazilian Government recently reported that cinchona seedlings supplied by the United States have been put out at Campinas and Baracéa.

A few small experimental plantings have been made in Venezuela within the last 20 years, but the chief current contribution of Venezuela to the quinine supply is in the form of bark from wild trees.

Transportation of the harvested bark to extraction centers is a major problem of the industry. This is particularly true in the precipitous mountain ranges of South America. Much of the bark from native stands is transported on mules to trucks. Some of the trails over which these mule trains must pass lead through snow and sleet at elevations of as high as 15,000 to 16,000 feet. Other courses of transportation consist of shooting of rapids in cinchona-bark-loaded balsa rafts. Although these means of obtaining the bark have picturesque and romantic connotations, they are, unfortunately, costly in time, money, and sometimes life. Airports are now under construction that will soon make possible the moving of the bark by air from the remote mountainous regions to centers where it will be processed or repacked for export.

Inter-American Cooperation

The United States, through the Department of Agriculture and the Foreign Economic Administration, is cooperating with all these cinchona-producing countries. The Foreign Economic Administration is concerned with the procurement of cinchona and such work as will expedite availability of high-quality bark. The Department of Agriculture is aiding through research, technical advice, and demonstration in the growing of the plants. It is also sending quality seedling stock to the most promising production areas and is endeavoring to establish plantings of cinchona species in Puerto Rico and Hawaii, chiefly for experimental purposes.

Variety Adaptation Essential

To people unfamiliar with sound principles of agriculture the development of the cinchona industry in this hemisphere might appear to be simply a matter of taking the better strains of clones that have been developed by the Dutch and planting them under optimum local conditions. Agriculturalists, however, know that such a plan could not be expected to pay dividends. The Georgia farmer, for example, who moves to New England or the New England farmer who moves to the dry-land section of Nebraska does not take a locally adapted variety of seed corn with him, for he knows that it would not compete with varieties adapted to the area to which he moves. It is also recognized that cultural methods vary with climate and soil conditions. This same basic principle of using the variety of the plant best adapted to local conditions, combined with locally proved methods of cultivation, is recognized by agricultural producers the world over.

A 200-pound load of cinchona bark begins its long trip to the war fronts

It is not surprising, then, that cinchona growers of this hemisphere realize they cannot directly borrow cinchona varieties from the Eastern Hemisphere and expect immediate success. They fortunately recognize that

(Continued on Page 50)

Pan American Union Photo

The alpaca grazes in serene comfort at altitudes where most animals could not exist

Sheep of the Andes

This is a story about four South American members of the sheep family: The llama, alpaca, guanaco, and vicuña. Except for specimens in zoos, these animals are found chiefly in Peru and certain areas of Bolivia, Ecuador, and Chile

by ELIZABETH P. TAPPY

In the lofty Andes of Peru, browsing peacefully in altitudes at which most animals would sicken and die, may be seen small herds of South American sheep—alpacas, llamas, guanacos, and vicuñas. All four of these animals produce a valuable fleece, particularly the alpaca, whose wool is a strategic wartime material. The wool or hair of the alpaca is delightfully light and warm and possesses the quality of shedding snow easily, thus making it a useful material for clothing troops operating in Arctic regions. Used for linings in sleeping bags, in parkas, flying suits, and outer garments for Navy lookout men, the wool serves all branches of our armed forces.

These sheep are indigenous to the west coast of South America. Living at altitudes between 6,500 and 17,000 feet above sea level, their grazing range really begins where that of ordinary sheep ends, at 14,000 feet. Although small herds exist also in the Lake Titicaca region of Bolivia, in southern Ecuador, and in northern Chile, these animals are more numerous in Peru than elsewhere.

Bearing a marked resemblance to the sheep and to the camel, these remarkable creatures possess certain characteristics in common with both, as they are inured to great extremes of cold, dampness, hunger, and thirst. They require relatively little oxygen in the air they breathe, a not-excessive heat, and very little water for drinking, as the moisture contained in their green food seems to suffice for months. They do need water for bathing to prevent a scab-like disease of the skin. They thrive on a small species of rush abundant in the bleak regions of the higher Andes and on all kinds of grasses, moss, and grains, such as maize and quinoa, a species of pigweed.

These sheeplike camels have been generally described as ruminants, without horns, wool-bearing, and cloven-hooved. The alpacas, numbering 740,000 according to recent estimates, and llamas, numbering 720,000, are the domesticated species, while the other two branches, the guanaco and the vicuña, have been seldom seen until recently in anything but a wild state. All four branches of the family are valued for their wool. The llama does double duty in serving also as a beast of burden.

These animals are believed to have roamed the Andes long before the discovery of America. Many fine articles of clothing made from alpaca wool, relics of the Inca Indians, are in the National Museum at Lima. The Incas are said to have used the animals for food as well as for clothing. Historians also report that alpacas were offered up as sacrifices to the Sun Gods. The black ones were reserved for Viracocha, the son of the Sun, and the white were reserved for the Sun God himself. The Collas tribe, before their conquest by Lloque Yopanque, third Inca of Peru, about 1171 A. D., worshiped the white alpaca as their principal presiding deity and offered up sacrifices to him. They believed that their divinity had come among them in this form and, as a mark of favor to them, procreated more abundantly in their territory than elsewhere.

The discovery of the great mines of Potosí is attributed to the accidental escape of a llama that had fled from its drove with a load of maize. The Indian driver pursued the llama up the slopes and ridges, and when night fell was forced to encamp at the summit. To ward off the intense cold, he lit a fire, and the following morning found to his astonishment that the stones around his campfire were filled with particles of melted silver.

Herds of alpaca and llama are almost the exclusive property of the Indians, who seem ideally suited to be their keepers. Walton, an early nineteenth century writer, even went so far as to attribute to the llama a resemblance to the Indian mountaineer, "in many peculiar traits of disposition, and exterior." He clarified this remark in a footnote characterizing the Indian, saying in part that ". . . he is fond of solitude and retirement; abstemious; . . . reserved, cautious, melancholy; has a peculiar sadness marked on his face. . ."

Since the discovery of these animals in South America by Europeans, great interest has been evinced in them, both as a curiosity and as a source of wool. During the last century, many attempts were made in England, Scotland, Ireland, Australia, and even in the United States to introduce alpacas and llamas into animal husbandry, but generally without profitable results. The failure of these efforts is attributed to various reasons. Confinement of the animals on shipboard during a long voyage, with impure air and unaccustomed feed, caused many to pine and die before reaching port. Those who did survive the voyage and arrived at their destinations suffered a disease said to have been the result of eating more luxuriant feed than that provided by their native pastures.

In 1800 Josephine Bonaparte acquired for her collection at Malmaison a pair of llamas forwarded by the colonial prefect of Santa Domingo, where they had been sent as a curiosity from the Spanish coast of South America. Later, in 1804, the then ex-Empress requested that the Minister to the court of Spain obtain varieties of the four species of Peruvian sheep to add to her collection of exotic plants and curiosities of natural history. An alpaca was brought to England in 1816 by Mr. Tharpe, of Chippenham Park, Cambridgeshire. It was visited by several naturalists and curiosos and was later exhibited in Piccadilly.

Attempts to foster llamas and alpacas in the United States are recorded in various government reports. For instance, a notice in the *American Farmer* in Baltimore in 1821 advocated their adoption; the American Agricultural Association of New York City raised a subscription fund for their introduction in 1846; and several animals were presented to Daniel Webster, then Secretary of State, by the Peruvian Government. Francis Thomas, a Minister to Peru, placed a small flock of alpacas on his farm at Frankville, Allegany, Md., in 1875. He gave glowing accounts of the beginnings of this experiment, but the ultimate outcome is not known. Alpacas and llamas are not raised commercially in this country today, and all attempts to introduce them into countries beyond their natural range have proved unsuccessful. Exportation of alpacas is now prohibited by the Peruvian Government. One of the few places in the United States at which specimens of all four animals may be seen is the National Zoological Park in Washington, D. C.

Although the four types of Peruvian sheep have certain similarities, it is interesting to note their differences.

The llama

The llama is the largest and strongest of the four species, measuring about 4 feet in height and weighing about 250 pounds. He is a clean-limbed animal, with thick wool covering the neck and body. The head, set on a slender arched neck from 2 to 2½ feet long, resembles that of a camel, with a long muzzle and slit upper lip. The pointed ears, usually held erect, are about 4

CI–AA Photo

Since the time of the Incas, the llama has been a beast of burden as well as a producer of wool

---

Mrs. Tappy is with the Western Hemisphere Branch of the Office of Foreign Agricultural Relations.

inches long and are tipped with white along the edges. The eyes are large, black, soft, and expressive. The body of the llama is somewhat similar to that of a deer, tapering to a very small waist set high under the haunches. The tail is 8 or 10 inches long and covered with wool and hair. On the llama's breast is a callosity, or hard, calloused area, about 3 inches wide and 6 inches long, upon which the animal rests when being loaded, while asleep, or while resting and chewing its cud. This callosity was apparently provided by nature to protect the breast from injury when coming in contact with rocky and ice-laden ground, just as the clawlike hooked spurs which arm the two front cleft hooves serve to support him on slippery or frozen mountainsides.

Since the time of the Incas, the llama has been primarily a beast of burden, more valuable in this capacity than as a wool producer. Until the advent of mules and donkeys, the llama was the only means of transportation and commerce in the Andes and served the Indians well by carrying loads of various commodities in two panniers slung across its back. The Peruvians were careful not to overload the llamas, who were capable of carrying burdens of not over 100 pounds. The Peruvian arroba, a weight of approximately 25 pounds, is based on an ordinary half-load for a llama.

Llama wool is used by the Indians for weaving blankets and articles of clothing, very little being left for export. The wool grows quite thick and shaggy, without the lustrous silkiness of alpaca and vicuña wool. The common color of the wool is a light brown, but it may be dun, gray, or almost any of the colors found in the horse. The wool under the body is always white and is sorted separately from the rest when it is shorn at all. Llama wool, as well as that of the other three species, has none of the greasy quality of sheep's wool and is unusually clean when sheared.

The llama is affectionate with his keeper, usually docile and tractable if gently treated, but at times shows a stubborn streak. If provoked, he will express his anger by throwing back his ears and spitting in the face of the offender from a distance as great as 3 or 4 feet.

The alpaca

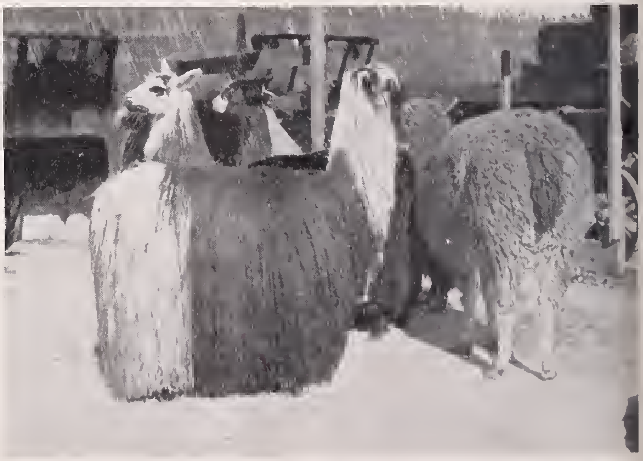
The alpaca is somewhat smaller than the llama, or from 2 to 4 feet in height, with short legs and a rather heavy-looking body which resembles that of the larger animal, with the same small, tapering waist. The body and legs are covered with thick fleece, often between 8 and 10 inches long, which may weigh from 8 to 12 pounds. The wool is soft and silky to the touch and possesses a brilliant luster, rivaling that of mohair. On some species, the fleece hangs almost to the ground and the shape of the body is scarcely discernible. The neck is long and thick, and the face is somewhat like that of a sheep. The ears are more erect than those of the llama. In common with the llama, it has the callous pad on the under body and spurs on the front hooves. The alpaca has a cleft lip and ruminates in the same manner as the llama, although he does not spit his moist cud when provoked. This is thought to be an indication that his disposition is even more amiable than the llama's.

Walton, in describing the two animals, says: "We think that no quadruped in nature is possessed of so fine a figure and more striking appearance than the Llama, freed from restraint, and bounding in his pasture grounds; nor do so much soft expression, and such innocent looks, sit on the face of any beast, as on the Alpaca. He returns, and appears sensible of the caresses of his keeper, and becomes unhappy at his absence." The alpaca is a more delicate eater than the llama and is equally abstemious with regard to drink. He does not feed while resting on his breast and is more dignified and less agile than the llama and the guanaco.

The alpaca is the most important wool producer of the four species. Alpaca fleeces vary in color through white, light brown, dark brown, gray, and black and are sometimes particolored. The black and brown fleeces predominate and are used most frequently in their natural colors, as they do not take dye as readily as the others. English weavers employ alpaca wool in the manufacture of a fine cloth bearing the animal's name, which is used for dresses, linings, and umbrella coverings. It is also used in England for the manufacture of a cheap flannel and in the United States primarily for fine coat linings. Another adaptation of alpaca is in imitation furs for wearing apparel and auto rugs.

Recently United States Government buyers have entered the market for alpaca and other South American wools and have bought up the 1942 clip for stragetic uses, having the wool shipped whenever freight space is available.

Rather primitive methods still exist in Peru for clipping the alpaca wool. Ancient animal corrals or enclo-



Pan American Union Photo

Some alpacas have wool that reaches the ground sures surrounded by crumbling stone walls are still used for herding the stock together for shearing. The alpacas are caught and thrown to the ground; then their four feet are tied together, rendering the animals helpless. The shearer grasps a bunch of wool in one hand and with a knife or shears in the other cuts the wool off close to the body. It has been found that by shearing every year instead of every 2 years, as was the former custom, the annual clip may be increased by 1 to 2 pounds per alpaca.

The clips are sold to the nearest agent and eventually are assembled in Arequipa, Peru, where there are extensive warehouses and wool sheds. Indian women, sometimes surrounded by their children, sit placidly on the floor of the sheds and through an acquired sense of touch assort the wool into piles with amazing rapidity. There are seven classifications, including the two better-known grades, "alpaca primera" and "alpaca suri." Only about 3 or 4 percent of the wool is rejected in the process of sorting, as the fleeces are much cleaner than those of ordinary sheep.

The Guanaco

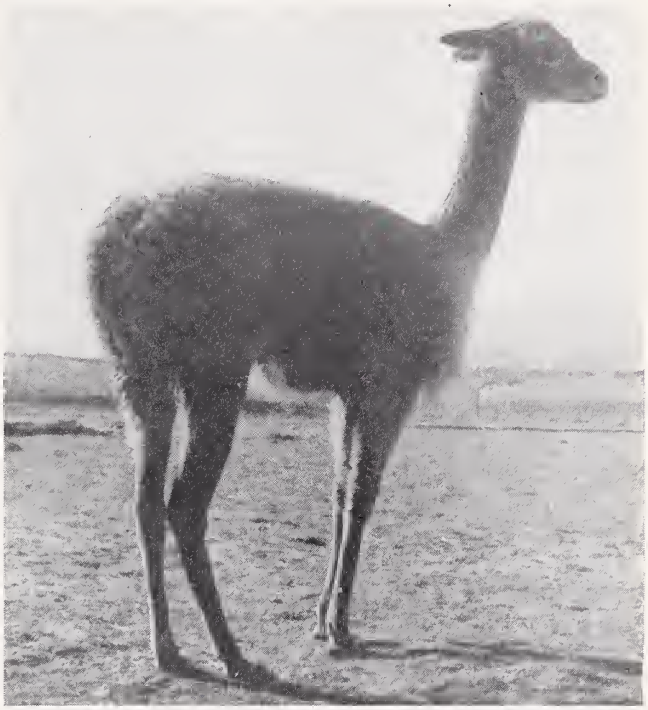
The guanaco, the larger of the two wild species, but smaller than the llama, is thought to be the original stock from which sprang llamas and alpacas. It is found in its wild state as far south as the Straits of Magellan, inhabiting altitudes even higher than the llama and alpaca. Although resembling the llama somewhat in outer form and possessing the same clean-limbed look, the guanaco has, however, a coarser shape and a more shaggy coat and is by far the swiftest of the four creatures. The callosity is not present, but hooked spurs arm the dimunitive forefeet. Guanacos are shy, vigilant, travel in small herds, and are extremely difficult to catch. Their wool is long and fawn-colored above the body and white beneath and is of little commercial importance, owing to the scarcity and wildness of the animal.

The Vicuña

The vicuña, a small gazelle-like animal, is a semiwild member of this group. It is the smallest and the rarest of the four and possesses a remarkably fine wool, said to be the softest of all known animal fibers. The wool on the back is tan, graduating to white on the under side. The vicuña's head differs considerably from the other species in appearing large in proportion to the delicate body. It is rounder, and the muzzle tapers to a very small point above the tiny mouth with its cleft upper lip. Its ears are less erect than those of the other Peruvian sheep and, like the guanaco, it has no callosity on the breast. The vicuña is even more timid and scarce than the guanaco, having been hunted almost to extinction. Present regulations forbid the killing of these animals, except for a certain percentage of males each year, and the exportation of skins is forbidden. Efforts to domesticate the vicuña have recently been undertaken in Peru and have met with success. More than 300 animals have been established on a hacienda near Puno in the Peruvian plateau region, and there are good reasons to believe the vicuña population will soon be replenished. Killing the animal to obtain its wool is no longer necessary, for in a domesticated state it can be sheared instead, like domesticated sheep.

Pan American Union Photo

In its wild state the guanaco is shy, travels in small herds, and is very difficult to catch



Courtesy of Grace Lines

The wool of this dainty little animal, the vicuña, commands tremendous prices and is of matchless fineness

Vicuña wool has that marked perfection which centuries ago caused it to be reserved for the ruling Inca, who dealt it out amongst his officers and the nobility but allowed none of the less fortunate classes to wear it upon pain of death.

About 900 pounds of vicuña wool were exported from Peru in 1941. Most of the wool is sold in New York by the Peruvian Government for the manufacture of cloth and garments for those who can afford to buy. A vicuña overcoat sells from $350 up.

Estimated total wool production in Peru for 1943 is 12,949 short tons, including 8,706 tons of ordinary sheep wool, 3,857 tons of alpaca wool, and 386 tons of llama, vicuña, and huarizo, which is the wool of an animal that is a cross between an alpaca and a llama. The average annual value of total wool exports for the 5-year period, 1938–42, was about $2,364,000, of which alpaca wool exports made up 65.5 percent of the total, as compared with 26.7 percent sheep wool and 7.8 percent huarizo, llama, and vicuña hair for the same period. Although there was little difference between the quantity of sheep and of alpaca-wool exports, the average value of the alpaca was more than twice as great. Exports of alpaca and similar animal hair or wool in the first 4 months of 1943 were about double the amount exported in the corresponding periods of 1941 and 1942. Total alpaca-wool exports in 1943 are expected to exceed 3,000 short tons, as compared with 2,687 short tons in 1941 and 2,539 tons in 1942.

The United States has recently taken the place of Great Britain as the leading importer of Peruvian wools. In terms of value, exports of these wools to the United States in 1942 amounted to $1,468,035, as compared with exports to the United Kingdom valued at $183,141. Great Britain imported 462 short tons of alpaca wool and 184 short tons of huarizo, llama, and vicuña wool, while the United States purchased 922 short tons of ordinary sheep wool, and 2,226 tons of other wool, all but 185 tons of which came from the alpaca.

Because of the limited supply, high prices, and a continued strong demand for wartime needs, the market for alpaca wool just now appears to be increasingly favorable.

PEARL HARBOR SENT QUININE HOME

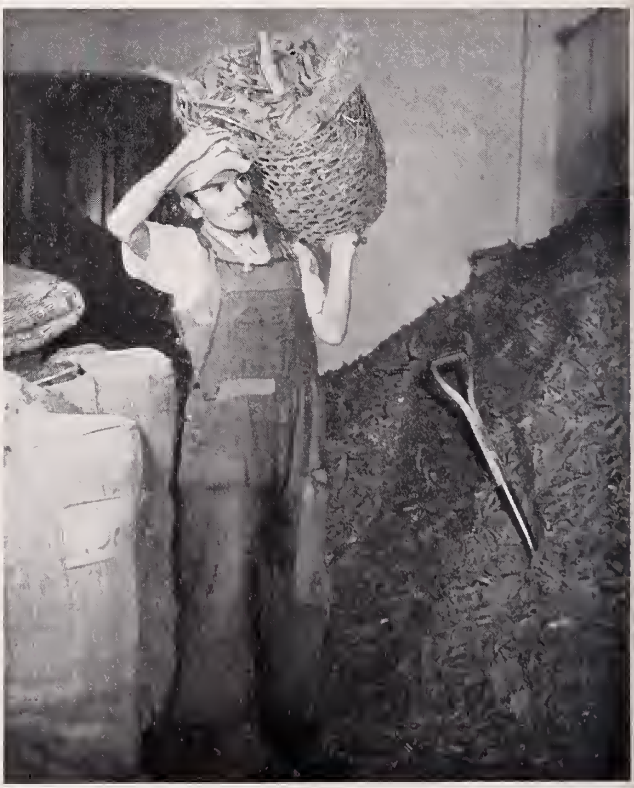
(Continued from Page 45)

a part of their work lies in the development of the best commercial clone for their own locality. Thus, the best cinchona for commercial production in Guatemala may not be best suited to Ecuador, Peru, or any of the other American Republics.

The selection of varieties adaptable to local conditions is now in progress in this hemisphere. In this work all available stock will be utilized, including not only clones of the famous *ledgeriana* form of *C. officinalis* but material from the reservoir of species and varieties native to Central and South America. Native species are known to occur on heavy clay, organic, and humus soils, at elevations varying from near sea level to about 10,500 feet elevation, and about as far as 11° north and 18° south of the Equator. Keeping pace with research activities, production nurseries and plantations are in operation. The cultural practices in these nurseries and plantations vary according to basic knowledge concerning adaptability of the various cinchona strains, but the production of cinchona is, generally speaking, no more involved than that of other forest tree crops.

Little information is available on costs of producing cinchona in the Western Hemisphere, and such as there is may be safely used only under the local conditions where it has been accumulated. Production statistics for India in 1936–37 give an average yield of about 3⅗ tons of dry bark to the acre, while in the Netherlands East Indies the 1937 average was about 3¼ tons to the acre. At the present time the United States pays 80½ cents per ounce for quinine sulphate, and the cost per ton of commercially valuable bark varies with the quinine content.

Contributions of plant material, expropriation of holdings of the common enemy, and establishment of plantations clearly demonstrate the sincerity of the cooperative effort many Western Hemisphere countries are exerting. They have invited the United States to help them with technical aspects of establishing this industry, the product of which is so important not only to the Allied forces but also to citizens during peacetime. Progress being made on this work augurs well for fine accomplishments that are to come from friendly hemispherical cooperation.



Dried cinchona bark is collected in warehouses in the country of origin preparatory to shipment to the United States or to local processing plants

Rural Reconstruction in Mexico

Near Tepoztlan, one of Mexico's most picturesque and friendly villages, a small demonstration in human-welfare improvement shows how people, working together, can enrich their way of life

by D. SPENCER HATCH

Three-quarters of a mile beyond the end of the road where tourists stop at Tepoztlan, Mexico, is the Camohmila Center and Extension. From the point where the road ends, a bridle path continues to the Demonstration Center. At the far corner of the Center the path forks, each fork leading to villages in two sets of valleys.

These villages, 11 in number, are real Mexican villages. No wheels turn here; transportation of men and materials is all on horses or mules. The influence of modern things and ideas has not been felt, and because of this, it is an ideal place to measure results obtained toward improved conditions in general through self-help and genuine cooperation among neighbors.

Camohmila Center was originally opened by the Mexican Y. M. C. A. as a camp for boys, but as interest grew, among nearby residents, in various crop experiments carried on by the camp manager, the International Y. M. C. A. became sufficiently interested to cooperate toward developing the project into one of general rural reconstruction.

Another fortunate feature of Camohmila's location is that the valleys surrounding it, like those of all Mexico, are on a slant. The highest of the 11 villages is 3,500 feet higher than the lowest. The climate of the highest is cool, temperate; the lowest is almost tropical. So fruits, vegetables, annuals, and other crops that prove to be adapted within this range of elevation and climate should be adaptable in a large part of Mexico. In each of the somewhat parallel valleys is an expanse of cultivable land and a village. The hills separating the villages are rocky, grand, and extremely picturesque.

This is the rugged country where Emiliano Zapata led the people of these villages during the revolution in their fight for possession of their land. The fact that the people did get the land and now hold full right to it is a basic reason why a self-help rural-reconstruction program can be successful. Zapata is still the great hero of all the people in these villages.

Like many acres of land in the United States, the soil at the Camohmila Center had been depleted of its productivity. No system of crop rotation had been followed, and little, apparently, had been done to determine what the land could best produce. In addition, control was needed over plant and tree pests. The possibilities for improving sanitation and educational and recreational facilities were also apparent.

A Soil-building Formula

Building up the soil seemed to be a fundamental problem; so, it was the first to be worked on. Two soil samples were analyzed by Engineer Miguel Brambila of the Mexican Government, of which he said: "*Sample 1.*—Subsoil is medium, first, because of its clayish texture which would probably make it unsuitable for plowing, and second, because of the lack of fertilizing elements and bacteriological flora, which will tend to make it almost nonproductive. To improve it use manganese sulphate, in the proportion of 50 kilos per hectare, also lime superphosphate, 300 kilos per hectare. Plant clover or soybeans for plowing under. *Sample 2.*—Much better quality. Texture very good; fertilization adequate and does not contain any large percentage of harmful alkaline salts. Rather deficient in manganese and in bacteriological flora. Use manganese sulphate as recommended above, sow leguminous plants periodically, and plow under."

With these diagnoses and recommendations to go on, an energetic effort began to make compost from all available weeds and waste with which to restore humus to the soil. The procedure for manufacturing this compost is to spread on plots of level ground, each not more than 16 feet long and 8 feet wide, a 9-inch layer of green material, weeds, sacking, newspapers, refuse, and any kind of animal waste. To this should be added 2 or 3 inches of fresh cow manure, but if none is available a greater proportion of the first layer of material should consist of fallen leaves, green legume foliage, green grass, etc. The addition of ordinary soil is necessary, and wood ashes or lime if the soil is deficient in lime.

This mass should be soaked thoroughly with water which will have the effect of "charging" it so that bacteria will start working and multiplying. Additional layers of the

---

The work of Dr. Hatch at the Camohmila Center is sponsored by the International Y. M. C. A. Prior to going to Mexico in 1942 he spent approximately 20 years in India doing rural-reconstruction and rural-education work in that country. Dr Hatch has written several books on rural conditions in India. The photos used with this article are by the author.

material specified above should be added until the heap is 3 feet high. At 2 intervals of 15 days each and 2 intervals of 30 days each, the whole mass should be turned and thoroughly watered. Thus, 90 days from the beginning of the process the compost is ready for use.

Experiments with various plants and legumes for plowing under as green manure showed that cowpeas did better than soybeans under prevailing conditions. The cowpeas grew luxuriantly, producing more material for humus, and had more nitrogen nodules on the roots. Rye, a new crop here, grew well and is considered a good crop for plowing under. Sudan grass grew profusely during the rains.

Toward Greater Diversification

Seventy kinds of field crops and vegetables were tried out, each in a small way, in an attempt to find new crops to grow on land that had previously grown little but corn. A second objective, no doubt equally important, was to try to vary the local diet. Even beans, extremely dear to the Mexican palate, had been driven out by the Mexican bean beetle. This pest attacked all nine kinds of beans included in the project, except two varieties of sojas, which stood out among the others untouched. The bean beetle was brought under control, however, with sodium arsenate sprayed on with a 30-cent hand pump, after the vines had been wet with a flit gun.

Of all the plants tried, those showing the best promise the first year were rye, oats, buckwheat, Sudan grass, sorghum, field beans, edible soybeans, soybeans for fertilizer, cowpeas, green and yellow string beans, carrots, radishes, turnips, kohlrabi, lettuce, cabbage, sweet corn, sweetpotatoes, mammoth Russian sunflowers, peanuts, and castor beans. Most of these are being tried for the second year; others deserve further trials. Some of them did badly because of poor seed, and some were damaged by pests for which no remedy has yet been found. Natural rainfall had to be depended on for the most part. The discovery was made, however, that some of the plants that did not do well during the rainy season would do well in the dry season if watered artificially.

Although the experiments carried on here at Camohmila Center may not be conclusive, they have proved that a wide variety of vegetables and fruits can be grown.

Twenty-one varieties of trees have been planted experimentally. They are still too young to show production of fruit. Only one of the trees we found here produced fruit that was unspoiled by pests. This was the *circuela*, which has a large red stone and looks like a plum. It is the villagers' best money crop. Worms affect the mango, and two different pests prevent the avocado from bearing after the first time. The banana, because of wrong variety and culture, is only an ornamental plant. Peaches grow small and sell for 8 cents a hundred. Despite these hazards and draw-backs, fruit culture appears to have wonderful possibilities in these valleys. This belief is shared by Governor Castillo of Morelos, who has lent financial support to the fruit development phase of the project.

A demonstration on how to make compost is given to a group of local farmers

The livestock and poultry branch of the experiment includes a few young head each of Poland China pigs, Gabardine milch goats, Jersey and Holstein bulls, merino sheep, barred Plymouth Rock and white Leghorn chickens, and Peking ducks. There is no intent to maintain a large number of any type of livestock but rather to keep only a few for experimentation and for breeding up the stock of the villages, largely through distribution and circulation of males.

To house the livestock, several small model structures were built, with the idea of their being copied. Before the first model poultry house was finished, one of the villagers had not only copied it but had built one twice as large, concrete floor and all. Lacking chicken wire with which to build the front, this villager had ingeni-

Before the first model poultry house was finished one of the villagers built this one, ingeniously using bamboo for the front. Pictured from left to right are D. Spencer Hatch, Don Trinidad Torres, and his son, Ignatio

ously used wild bamboo, firmly set in mud. This construction attracted the attention of forty delegates of the Second Inter-American Conference on Agriculture, who thought it was excellent.

A Model House Is Built

When a model house was built, the villagers named it "*Yancuic Cali*" (new house) from their *Nahuatl* language, which they still love. Of this house, outsiders said it would probably be the last of the demonstrations to be copied because the people are conservative about houses and do not build a house oftener than once in 50 years.

Yancuic Cali was built on the far corner of the Center's 11-acre plot of ground, where the bridle path branches off to two series of villages. It is of adobe, not much more costly than the ordinary house here, but it is whitewashed, has a floor, windows, a place raised from the floor for making *tortillas*, a 43-cent shower bath, beds of loose, springy boards on wooden horses, which can be taken apart and put out in the sun. On the beds are warmer and more comfortable corn-husk mattresses than the people are accustomed to, and a patchwork quilt that was made right in the house. For the first time in this region, stovepipes direct the smoke out of the house. Around the house can be seen a lawn, fruit trees, and a garden to ensure green food at all times.

Many visitors stop to see *Yancuic Cali.* This model house and latrine are a step toward better and healthier living

Many visitors have stopped to see *Yancuic Cali.* A young teacher, recently married, said she had a piece of land in Tepoztlan and that such a house would just suit her and her husband; they have started building. Girls in Ixcatepec village are saying to the boys: "We won't marry any boy who won't make us a model house." Melquidades, who had worked as a laborer building *Yancuic Cali*, married and soon began making adobes for his house to be built on a beautiful site overlooking the brook. He is building his house with the help of only one other boy.

The leader of Ixcatepec has rebuilt his house which, though consisting of one room and a kitchen, had housed a family of 11. "I'll make it," he said, "as bright and attractive as *Yancuic Cali.*" He made more rooms, including bathroom and dining room, put in sufficient windows and doors and a concrete floor, and colorwashed all of it. Following the example at *Yancuic Cali*, the nearest village has made plans for latrines at homesteads and for the new school which has been built with the cooperation of the people, the Y. M. C. A., the Center, and the Government. So began the movement for better and healthier housing.

Response Is Quick

The quick response of the people makes for effective development of new ideas and new ways of doing things. Work projects at the Center that show good results and are suitable to the area are viewed with great interest by the native folks. When they decide to adopt a new idea or practice, they are willing to pay the price, whatever it may be. Stubbornness is a virtue with them. They cannot be induced to do something they do not want to do or do not believe in. Offer them money many times the value of a piece of land, a donkey, or a duck, and it tempts them not at all if they have decided not to sell.

Quick response to new ideas is characteristic of the women as well as of the men. When the Center was inaugurated, a few samples of patchwork quilts and wool sweaters were exhibited which teachers in the Ixcatepec village had taught some of the girls to knit. Many women and girls who saw the exhibit immediately wanted to learn to knit. Now there are 89 women and girls in the knitting class. At first the girls knitted only for their families who were in need of warm clothing but they soon became so proficient that they had sweaters to sell. An order for 200, in bright shades of brown, green, blue, and gray, was ready long before the promised delivery date.

All the processes of spinning, weaving, and knitting are taught at the Center

These people are industrious workers when they are convinced that the work they are doing is for their own

(Continued on page 57)

Hacienda Pichilingue

On 40,000-acre Hacienda Pichilingue in Ecuador, a practical effort is being made to increase production of insecticide-bearing derris and lonchocarpus, Hevea for rubber, cacao, and other tropical crops

by LEWIS E. LONG

No one seems to know when Hacienda Pichilingue originated as an estate, but the man who has been in charge of it for the past 30 years believes that some of the present stands of cacao were planted over 100 years ago. Ecuador once led the world in cacao production, and there is evidence of this at Pichilingue.

Late in 1942 the Pichilingue property was purchased by the Ecuadoran Development Corporation, a corporation sponsored by the Government of Ecuador and financed by a loan from the Export-Import Bank. Under a three-way agreement having as parties the Corporation, the Ecuadoran Government, and the United States Department of Agriculture, an agricultural experiment station is being established on the property, with a view to developing production of such strategic crops as derris and lonchocarpus, which are sources of insecticides, and Hevea for rubber. Production of cacao and coffee, plantings of which already exist, will be continued. Pichilingue is one of four such stations located in South and Central America, the others being in Peru, Nicaragua, and El Salvador.

Although only a few minutes south of the Equator, the climate at Pichilingue is comfortable. Nights are delightfully cool and, except in the direct sunlight, the days are not uncomfortably hot. The average elevation above sea level is about 200 feet. Rain, estimated at 100 inches a year, nearly all comes at night between December 15 and the 1st of July, and seldom does any fall from July 1 to the middle of December, during which time dense fogs are common and the days are ordinarily cloudy. Most crops are planted during the rainy season but some planting is carried on the year round. To the local people there are only two seasons—the rainy or winter season, and the dry or summer season.

This old estate lies between the Ríos Quevedo and Macul in Los Ríos Province of Ecuador. As the crow flies, it is about 100 miles north by northeast of Guayaquil, Ecuador's principal inland port.

The hacienda is divided into several subdivisions, each with an identifying name. A few miles down the Río Quevedo from Pichilingue headquarters there is, for instance, a unit called Pajarito, which has its own drying beds and storehouse for cacao and coffee, about 5 miles west and a little south of Pajarito on the Río Mocache is Estancia Nueva (new ranch), and on an east-west trail along the north side of the property is the unit Virginia. Various trails, showing signs of heavy traffic in years gone by, now serve only for ingress and egress to and from these subdivisions or property units.

Sembradores

The men who live on and work certain plots of ground at Pichilingue are called *sembradores*. Literally, a *sembrador* is a "planter of seeds" or a "seeder". But in this part of Ecuador a *sembrador* is a person who occupies and uses virgin land that the true owner does not happen to be using. Once the land is cleared and planted, the law provides that the planter, if he is dispossessed, shall receive from the owner of the land a fixed sum per plant. There are now about 200 of these *sembradores* on the Pichilingue property.

The holdings of the *sembradores* are scattered throughout the planted area controlled by the Ecuadoran Development Corporation, most of which is situated across the east end of the property to a depth of 5 or 6 miles back from the Río Quevedo. The total acreage of all plantings on the hacienda at the present time is estimated at 6,000 acres.

Soil, Flora, and Fauna

The soil on the ridges of this land and on some of the bottom lands is deep and fertile. Generally, however, the bottom lands are not well suited to crops other than cacao or rice, because river action during years gone by has left a layer of sand a few inches below the surface A few areas along the Río Quevedo and other streams are swampy, but drainage is generally good on lands occupied by cacao, coffee, and bananas.

As previously mentioned, the improved lands of Pichilingue support a cover of cacao, coffee, plantains, and bananas. These are interspersed with large trees that were left to supply shade for the cacao, and among them are a few hardwood species of commercial value.

The author of this article is on the staff of the Office of Foreign Agricultural Relations and spent about 7 months at Hacienda Pichilingue setting up the experiment station phase of the enterprise.

In the virgin forest there are also various species of durable hardwoods, and back farther from the streams are excellent stands of balsa and Castilla, a native rubber tree.

Several species of bamboo abound in the forests, two of which supply most of the structural material for houses. Two types of leaves supply roofing, and a vine supplies cordage to take the place of light rope. The inner bark of cacao sprouts supplies a stringlike cordage for sewing up sacks and tying bundles or packages.

This old 17-room pole-and-bamboo-constructed house has many uses at Hacienda Pichilingue

A large variety of orchids grow wild in this tropical jungle, as do many other beautiful flowering plants. Citrus fruits abound; papayas are common, as are numerous other tropical fruits, including the avocado, which is quite common in fruit markets of the United States.

There is less animal life at Pichilingue than might be expected in such an environment. Domestic pigs are quite numerous in the cacao forest. Squirrels, two species of rabbit, and the cavy, a large rodent locally called a *guantusa*, are hunted for food. Occasionally a jaguar, called a tiger by the natives, is killed or a jaguar kitten is captured after the mother has been driven away by dogs.

These same animals may be found in the wild virgin forest, except that the domestic pig is replaced by the peccary, locally called a *saujena*. Monkeys are frequently seen, and sloths are common but seldom come into view. Everywhere there are birds, but they are heard far more than seen. Lizards, an occasional iguana, and many kinds of snakes make this jungle their habitat. The coral snake, fer-de-lance, and several other species of snakes said to be venomous, are definite hazards to forest workers.

Insects which have economic disadvantages are mosquitoes, flies, fleas, bedbugs, and a very small black insect called a *jejen* which has biting equipment far out of proportion to its size. Also present are various kinds of ticks, some of which attack man as well as domestic animals. And of course the bacteria and amoebas common to all tropical climates are present or potential at Pichilingue. Ants are troublesome to both animals and plants, and wasps are so numerous that they sometimes retard land-clearing work.

Improvement Work Begins

Improvements on Hacienda Pichilingue when the Ecuadoran Development Corporation took it over consisted of a 17-room, pole-and-bamboo-constructed house which was being used as a residence, store, general storehouse, and a chicken house; two smaller houses of similar construction that were being used for living quarters and storage; simple dock facilities; pastures and corrals; drying beds for cacao and coffee; and various bamboo houses for the laborers. All buildings were of native materials, except for iron roofs on the three first mentioned. All were in need of repair.

Up to the middle of August 1943 considerable work had been done to improve the estate proper, and several planting projects had been started. In some instances what seemed important at the outset was superseded in importance by other work, whereupon it became necessary to give priority to the more pressing problems. The most notable accomplishments were remodeling the main house, including installation of facilities for running water, electric lights, and a septic tank; repairing the dock; constructing of the first unit of concrete-floor barracks for the laborers; setting up a rubber-coagulating plant; opening up about 5 miles of roadway; clearing 50 acres of land, 15 acres of which was stumped for nursery use; planting about 20 acres of derris; and the construction of three concrete cacao-propagation bins. Some 30 temporary dwellings, eating places, a store, and one dormitory were built entirely of native materials. One well had been dug, and many lesser undertakings had been completed toward getting development under way.

The laborer-housing problem is solved with local materials and help

Owing to inability to obtain certain equipment and the difficulties of transportation from Guayaquil to

Pichilingue, the work at the hacienda was temporarily handicapped. In wide contrast, however, to the ubiquitous machete, there were on hand two dump trucks, one track-laying-type tractor with bulldozer, one ordinary tractor, two pumps with built-in power plant, and a home-lighting plant. Lumber was turned out with a battery of five whipsaws. Farming implements included two tandem disk harrows and two disk gang plows.

Livestock belonging to the Corporation which supplies the station included 36 riding horses, 27 mares, some with colts, 64 mules, 8 cows, 8 oxen, 3 bulls, and 13 head of other cattle. Plans were to increase the cattle herd in order to supply more meat to the laborers.

In connection with the United States program to obtain rubber, a small rubber-coagulation plant was in operation on the hacienda. Former rubber gatherers of the area supplied latex to this plant for so much a pound, and efforts were made to increase activity along this line. Production did go up rather sharply in late June, partly because of the dry and more favorable weather and partly because the plant began to purchase maroma, or dry crude rubber, which is more easily handled and transported.

By August the rubber-coagulating plant was operating on a profitable basis, but the area within easy reach had been pretty well exploited for latex, and transportation problems were arising. The establishment of another plant and trading post on the west side of Pichilingue was being considered on the premise that it would be more expedient to move coagulating facilities to the raw product than to solve transportation problems.

One of the first objectives of the Cooperative Experiment Station was to move to Pichilingue seed stocks and plants existing at Conducta Station, set up by the Ecuadoran Ministry of Agriculture near Guayaquil in 1939 in what proved to be a less satisfactory location. Other tasks high on the priority list were to care for planting materials intended for use by the Corporation in getting commercial production under way and generally to do research toward stimulating the over-all complementary-crops program.

Although the main emphasis at Pichilingue has been on rubber and rotenone-producing plants, the station had, by the 20th of last August, 52 species and 79 varieties of plants in the nurseries, not counting plantings made to supply food for the boarding house.

All in all, progress at Pichilingue toward its objective has been encouraging. Although the prime purpose of the work at this old Ecuadoran hacienda is to develop new crops and better ways of producing vitally needed crops, the improved living conditions for the native laborers engaged in the production of complementary products is a gratifying sidelight. One of the first acts of the management was to increase the basic wage from 22 to 29 cents a day. Later this was increased to about 36 cents a day and after a few weeks was still further increased by providing meals to the workers as a part of their daily earnings. These increases were in harmony with wage scales of the better-managed neighboring haciendas. Before a school got under way, many of the native boys and girls who applied for work were hired to do lighter tasks at proportionate wages. In addition to better wages for the workers and school for the children, medical service is now available at Hacienda Pichilingue.

Thus has a beginning been made through the joint efforts of the Ecuadoran Government and the United States Department of Agriculture to transform a run-down cacao- and coffee-producing hacienda into a modern farming establishment producing, in addition to these two crops, such strategic commodities as rotenone and rubber plants for the mutual benefit of both countries.

A modern bull-dozer clears land . . .

for a rubber nursery

ALONG THE *Agricultural Front*

▲ Inter-American Institute Acquires Permanent Status

Representatives of eight American Governments having signed the Convention for the establishment of the Inter-American Institute of Agricultural Sciences, the Institute has acquired a permanent status. The Convention was opened for signature at the Pan American Union in Washington, D. C., on January 15, 1944. Up to the present time the Convention has been signed by Secretary of State Hull on behalf of the United States and by representatives of Costa Rica, Cuba, Ecuador, Nicaragua, Panama, Honduras, and the Dominican Republic.

The Institute, organized to encourage and advance the development of agricultural sciences in the American Republics, has, since June 18, 1942, been functioning under a District of Columbia charter and with funds supplied by the Office of the Coordinator of Inter-American Affairs. The Governing Board of the Pan American Union has constituted the Institute's Board of Directors. Under the recently signed Convention, the direction of the Institute will continue under a Board of Directors composed of the representatives of the 21 American Republics on the Governing Board of the Pan American Union. An administrative committee and a technical advisory council, however, will aid the Board of Directors and officers in carrying out the purposes of the Institute. As soon as the required number of countries have deposited ratifications of the Convention with the Pan American Union, the financial support of the Institute will come from the contracting Governments.

Field headquarters for the Institute are at Turrialba, Costa Rica, formal inauguration of which took place on October 7, 1942. The cornerstone for the first permanent building was laid March 19, 1943, by President Guardia of Costa Rica and Vice President Wallace of the United States.

To facilitate its functions as a center of agricultural research the Institute is constructing buildings at Turrialba to house students and faculty, and its 2,500 acres of land, generously donated by the Costa Rican Government, is being adapted to investigational work on tropical crops, such as rubber, quinine, fibers, oils, and food crops. A substation for the development of high-yielding and disease-resisting rubber trees has been opened in the Republic of Panama. A permanent faculty of outstanding agricultural scientists is being selected. The student body will consist of graduate students from the American Republics.

▲ El Salvador Children to Produce School Lunches

In the little town of Santa Tecla, El Salvador, under adult supervision, school children are learning gardening and are eating the harvest of their labors. This is being done under a food project worked out by the community, with technical assistance from the Institute of Inter-American Affairs, a project which includes not only raising food but also cooking and serving it. Santa Tecla provides the land, water for irrigation, part of the tools, and kitchen and dining-room equipment.

The Institute, through its food mission in El Salvador, is providing this technical advice at the request of Santa Tecla for aid in improving the diet of its school children.

▲ Brazil Enters Into Rice Export Agreement

Under an agreement with Brazil the United States and Great Britain have obligated themselves to purchase the exportable surpluses of the 1943–44 and 1944–45 Brazilian rice harvests, according to announcements in the *Jornal do Brasil* and the *Gazeta de Noticias* of Rio de Janeiro on December 23, 1943. Brazil reserves the right, however, to provide for domestic needs as well as normal exports to American countries which customarily import Brazilian rice. The announcements explained that prices involved under the agreement were fixed at a level designed to stimulate further development of Brazil's rice industry.

RURAL RECONSTRUCTION IN MEXICO

(Continued from page 53)

benefit or when they have a partnership interest in it. There is a fundamental psychological difference between working for themselves and working for the business interests of an employer. Men, women, and children work long hours in their fields here with little equipment except their hands. They retire in the evening without lighting any lights and go back to the fields early in the morning. Each village has had a festival once a year.

The social program of the Center so far consists of a *fiestecita* from 5 to 7 o'clock every Friday evening. Boys and girls, men and women meet in the exhibition building or outside for songs, games, and dancing. They come just for a good time. This social program will soon be enlarged to include such sports as *charro* (in ornate riding costume) activities. Caring for, riding, and lassoing horses will be coordinated with teaching how to care for all animals. This appeals forcefully to all Mexican boys and girls. The *fiesta* is necessary to the Mexican heart.

The work at Camohmila Center, although new, has begun to develop in these people a better appreciation for spiritual, mental, physical, social, and economic improvement. Willingness to adopt new ways of living and a higher degree of cooperation for their common good suggest the dependence of physical accomplishment upon spiritual enlightenment. In a relatively small way, this emphasis is being given by demonstration without any verbal preaching or mention of denominations. These folks say they like the idea of joining together to better their lot in the world.

▲ Mexico Makes Notable Progress During Year

The agricultural front in Mexico has moved forward on many sectors during the past year, according to an official report discussing agricultural phases of President Avila Camacho's message to Mexico's Thirty-ninth Congress. Because of the war the country has striven for maximum agricultural production, not only to meet the most urgent needs of the moment but at the same time to plan for the post-war years.

Despite war conditions, Mexico has continued its geographic studies and land surveys; small agricultural projects have been increased; aerial photographs have been made of Tabasco, the Lerma River and lake regions, and the hot lands of Michoacán; the geographic map of the country, begun in 1927, has been finished; to improve weather reports, new meteorological stations have been established.

The Livestock Research Department has made intensive studies concerning various livestock diseases such as encephalomyelitis, brucellosis, dourine, and cholera. Toward livestock improvement, animal feeds and animal genetics have been studied. Selection of seed corn, experiments conducted on wheat, and plant breeding of chili have resulted in great benefits for *ejidos* (collectively owned lands) and small farmers.

The hope is expressed that experiments with Hevea rubber will permit the planting of 2 million seedlings during the current year, which will be expected to furnish 80 percent of Mexico's rubber needs. Experiments with fertilizer, cultivation methods, and drainage of land for sugarcane have increased production considerably. The propagation of olive trees has continued and attempts have been made to increase cocoa production through higher yields and disease control.

Of more general significance is the fact that plans have been made for a national campaign to improve rural conditions. The Mexican Government has endeavored to popularize modern agricultural equipment. During the past year 279,306 pesos (about $57,500) worth of modern plows were supplied. The National Agricultural and Livestock Exposition and 42 local, regional, and state expositions stimulated farmers who have been trying to improve their farming methods.

Listed as Mexico's principal products for export are henequen, cattle, coffee, chicle, palm fibers and lechuguilla, bananas, vegetable wax, guayule, rice, and tomatoes. Principal import products mentioned are wheat, wool, malt, cocoa, hides, copra, hops, malt and barley grain. The production figures for the past 5 years show that the harvests of 1942 and 1943 were the best for that period.

▲ Venezuela Increases Its Fishing Business

Although nearly surrounded by the sea, Venezuela in 1937 imported approximately 31,000 tons of sea food. Now, in an effort to develop new food resources, the Republic is on a fish-export basis. The Venezuelan Department of Agriculture estimates the 1943 catch at 40,000 tons, more than 60 percent of which is salted, dried, or canned, while the rest is sold as fresh fish in the local markets.

Venezuelan waters yield a variety of fish with commercial possibilities, including the kingfish, Spanish mackerel, tuna, red snapper, bluefish, and pollock. Shark fishing has also become a profitable undertaking. In developing its fishing resources, Venezuela is opening what may lead to more extensive use in the hemisphere of fish as a source of food for both war and post-war needs.

The United States has cooperated with the Caribbean countries in exploring their vast fishing possibilities, both for local use and for export. Outside the Caribbean area, particularly in Chile and Peru, strides have been taken to develop the fishing industry as a means toward supplying increased food needs.

▲ Argentina Revamps Agricultural Department

A decree, effective January 1, 1944, provides for a reorganization of the Argentine Department of Agriculture. The decree stipulates that an Under Secretary of Agriculture and four Director Generals are to be appointed and that a number of bureaus will be set up to handle livestock, research, statistics, education, national parks, forestry, etc. The National Bureau of Electric Power, National Meat Board, Grain Regulating Board, and the National Grain Elevator Commission, all formerly operating as independent agencies, will be incorporated in the reorganized Department of Agriculture.

▲ Dehydration Plant in Cuba

Under an agreement with the Commodity Credit Corporation a United States dehydration company has built a vegetable-dehydration plant in the town of Colón in Matanzas Province, Cuba. Delivery to the United States of such dehydrated vegetables as sweetpotatoes, beets, and carrots is scheduled to begin early in 1944.

The belief is expressed that this new industry will materially benefit the economy of Cuba and should help to make possible for that country a better year-round supply of good, cheap food when the war is over.

▲ Peru Plans Large Irrigation Project

An irrigation project involving the expenditure of $15,000,000 over a period of from 3 to 8 years is planned by Peru, the Peruvian press reveals. The project will be in the Chimbote region, where it will irrigate some 250,000 acres now largely desert. Development of sanitary facilities is already under way in the town of Chimbote in anticipation of its increasing importance as a port and as an industrial and agricultural center.

AGRICULTURE IN THE AMERICAS STANLEY H. GAINES, EDITOR

A monthly publication of the Office of Foreign Agricultural Relations of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents per copy, or by subscription at the rate of 75 cents per year, domestic; $1.20 per year, foreign. Postage stamps will not be accepted in payment.

Gifts of the Americas

KAPOK

by CHARLES H. BARBER

The "silk-cotton" floss, known commercially as kapok, is obtained from a grotesquely shaped tree that is indigenous to tropical regions of Latin America as well as of southern Asia, particularly the Netherlands Indies. Fillers for mattresses, cushions, sofa pillows, and upholstery are the more common civilian uses of this tree-grown fluff—its remarkable resiliency and nonmatting characteristics make it good to sit and sleep on. Low thermal conductivity and high ability to absorb sound make it valuable as an insulator for refrigerators on trains and trucks and for soundproofing in walls of film studios, auditoriums, and hospitals.

Kapok, like many other tropical products, has gone to war, too, and is now on the high priority list of materials reserved for military use. Kapok has five times more buoyancy than cork and, when compressed for use in life jackets, portable pontoons, and buoys supporting flares to guide ships or planes, it supports in water about 35 times its own weight. A portable pontoon containing 90 pounds of kapok has a carrying capacity of about 300 pounds. A 30-day submersion test of kapok showed only 10 percent loss of buoyancy, and this was restored by drying in the sun.

As picked from the tree, the kapok fibers vary from ½ to 1½ inches in length. Each fiber is composed of cells that form a hollow air-filled tube, covered with a waxy substance that makes it moisture repellent and buoyant. The fiber is so light and fluffy that it is usually compressed into bales or containers or is stitched between layers of flame-proofed cheesecloth or paper before it goes into a finished product.

In Alaska and on the cold battlefronts of Italy and Russia, a sleeping bag lined with kapok is a valuable part of the soldier's equipment. Its insulating and water-repellent qualities also make it superior insulation for planes flying in subzero temperatures, as lining for gloves to handle dry ice, and as surgical dressings for wounds, particularly in the Tropics, where cotton dressings absorb moisture.

Java and other areas that normally supply about 90 percent of the world's kapok needs are temporarily under enemy control. This fact, coupled with the importance of filling military requirements, means that new sources of this strategic material must be developed. Up to the present time the kapok trade of Latin America has been about equally divided between Ecuador and Brazil, with smaller quantities being exported from Costa Rica, the Dominican Republic, Cuba, Mexico, and Peru. Kapok is not a textile fiber and therefore does not compete with cotton for yarn or woven fabrics.

Encouragement for expansion of the kapok industry so far has been largely in the form of higher prices and organization of collection centers. There has been no direct sponsorship of a production program by importing countries. Reports show that in 1940 about 325,000 seedlings were planted in private nurseries in Guatemala and 195,000 in El Salvador, but these trees will not begin bearing until 1947 or 1948. Once they start producing, though, they will keep it up for about 50 years.

Kapok trees grow 50 feet high or more, and the base, just above the ground, sometimes occupies an area 20 feet in diameter. In 2 or 3 years after it starts to produce, one tree will yield annually about 600 pods, containing a total of around 6 pounds of fiber and at least 12 pounds of seed. To harvest these pods, natives climb the trees and clip the pods off the branches with knives attached to long poles. The pods, which are about 5 inches long and 2 inches thick, are opened by hand and the fiber spread out to dry before it is put through a machine that removes the seed by centrifugal force.

Kapok seeds yield about 45 percent of their weight in a tasteless and odorless oil that resembles cottonseed oil. This is said to be edible without refining, but its more common use is in the manufacture of soap. The oil-cake residue is used both as feed for livestock and as a fertilizer. And, if the current paper shortage continues, this gift of the Americas can make a bid for further usefulness—experiments have proved that the wood pulp from kapok trees can be processed into low-quality paper.

HONDURAS

Honduras, "the banana Republic," is about the size of New York State. Along its entire northern side is the Caribbean Sea, but on the southern side it reaches to the Pacific for only about 80 miles. Guatemala and El Salvador on the west and southwest and Nicaragua on the east are neighboring countries. Tegucigalpa, the capital, is 60 miles by air inland from the Pacific port of Amapala and 120 miles by air from the north coast.

Along the Caribbean is a coastal plain some 50 miles wide. Between this coastal plain and the Pacific are mountains, as high as 10,000 feet in the southern part of the country, and broken by numerous plains, basins, and valleys. The principal plain is the Comayagua, northwest of Tegucigalpa. Jamastran, Lepaguare, and the Valle de Sula are other important plains. In these plains and basins are the headwaters of the navigable rivers flowing into the Caribbean.

While the many valleys and plateaus of Honduras are fertile and no doubt capable of tremendous production, much of its area is uncultivated and even unexplored.

Climate

Climate is an important agricultural consideration. The northern coastal plain is hot and humid and receives more rain than the Pacific coast. Up in the mountains, however, the temperature is more moderate, with an annual average at Comayagua of 75° F. and a monthly range of about 6° above and below the average. The rainfall at Tegucigalpa averages about 65 inches.

The People

Most of the million inhabitants of Honduras are rural dwellers. Tegucigalpa is the largest city, with a population of about 50,000. The territory of Mosquitia in the eastern part of the country is sparsely settled, largely by full-blood Indians.

Agriculture

Corn is the principal crop of Honduras, but the economy of the country rests heavily on bananas, the major export crop. Bananas furnish most of the exchange for the purchase of imported goods and account for approximately 80 percent of the total value of all exports. All but two states produce bananas, but commercial production is on the northwest coast to about 60 miles inland.

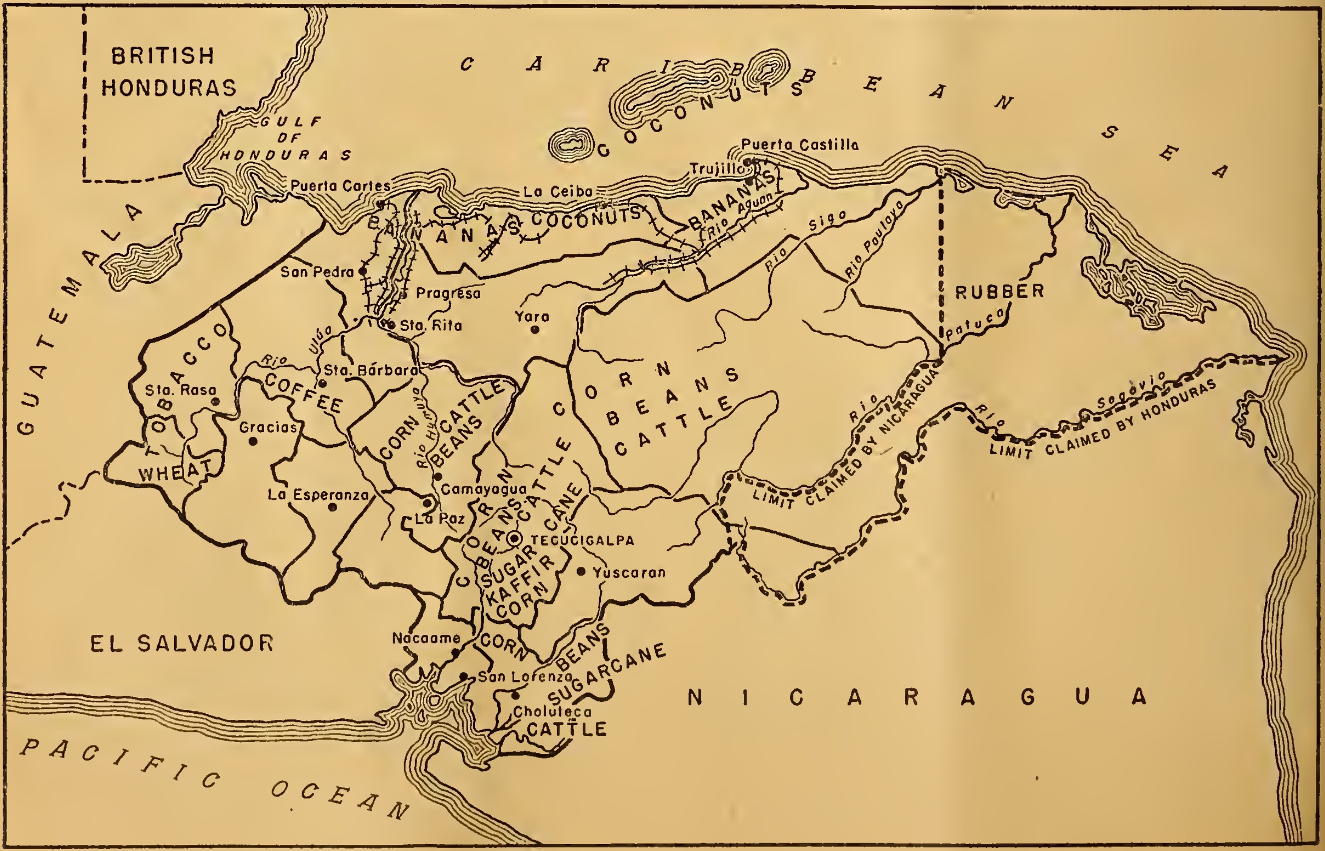
Corn, beans, sugarcane, and rice are produced for home use, the Departments of Tegucigalpa, Comoyagua, and Choluteca being the heaviest producers, since they have the heaviest concentration of people. Corn occupies more than half the acreage sown to the 12 principal crops. Other foods grown include kafircorn and yuca. Coffee is grown on the hillsides for home use, and a small quantity is exported.

The cattle population of Honduras is about 650,000 and is increasing. In addition to cattle, Honduras has about 235,000 hogs, 14,000 goats, and 10,000 sheep.

Other Resources

Mineral resources are extensive, although gold and silver are the only ones that have been exploited to any extent. Exports of precious metals are second in importance to bananas.

The forests of Honduras also provide a valuable source of wealth. Mahogany is an important minor export, large stands of which exist in the Mosquitia territory, the interior valleys, and near the south coast. The forests also contain good stands of Spanish cedar, as well as kapok, rubber, and many varieties of palms.



U. S. GOVERNMENT PRINTING OFFICE: 1944

752A
Ag2.

CURRENT SERIAL RECORD
MAY 11 1944

Agriculture in the Americas

Issued Monthly by the OFFICE OF FOREIGN AGRICULTURAL RELATIONS
UNITED STATES DEPARTMENT OF AGRICULTURE

IN THIS ISSUE

	PAGE
Paraguay Improves Its Agriculture	63
Flowers That Fight Malaria	66
Henequen From Cuba	69
Dairy Cattle of Colombia	73
Along the Agricultural Front	76
Gifts of the Americas—The Cashew	79

April 1944

NAMES & NEWS

Captain Luis Samoza, son of the President of Nicaragua, in addition to his duties as military attaché to the United States, is taking a postgraduate course in animal husbandry at the University of Maryland. He is a graduate of the University of California, where he majored in agronomy. Upon his return to Nicaragua he plans to engage in cattle-improvement work.

Harry H. Schutz of the U. S. Department of Agriculture is on leave to the Food Supply Division of CI–AA for an assignment to Lima, Peru, where he will, at the request of the Peruvian Ministry of Agriculture, plan and establish a comprehensive reports-and-statistics system, somewhat similar to the crop-reporting system of the United States.

At the request of the Quinine Producers' Association and the Guatemalan Government, *Ross E. Moore,* Assistant Director of the Office of Foreign Agricultural Relations, is in Guatemala to work out plans concerning research assistance with respect to cinchona production in that country.

Prior to his stop in Guatemala Dr. Moore attended to official business in Ecuador, Colombia, and El Salvador. In Ecuador he attended, as a member, a meeting of the Board of Directors of the Ecuadoran Development Corporation and also spent some time at the cooperative experiment station at Quevedo in the interests of completing plans for cinchona development; in Colombia he discussed with officials of that country further collaboration in the production of cinchona, rubber, and certain other complementary and strategic crops; and in El Salvador he visited the cooperative agricultural station at San Andrés and discussed with Salvadoran officials the agricultural research program being developed in that country by the *Instituto Tecnológico.*

Hevea Budgrafting Improved

Arnold White and *E. P. Imle,* Agricultural Research Administration specialists, have learned how to increase by 50 percent, efficiency in budgrafting Hevea, the rubber tree of the American tropics. This knowledge has been acquired through intensive study of rubber plants at the cooperative field station of the Department at Turrialba, Costa Rica.

They found that the young Hevea rubber tree grows by "fits and starts," producing successive flushes of leaves, the terminal bud remaining quiescent or dormant between leaf bursts. Budwood cut at the end of the rest period, they discovered, gave a 50 percent advantage over that taken in the active period if there were any delay between cutting and use, such as shipping from one locality to another. Their experiments also showed that girdling the young Hevea plant 9 to 14 days before cutting the budwood greatly increased the percentage of budding successes.

Dr. E. W. Brandes, in charge of rubber plant investigations, Bureau of Plant Industry, Soils, and Agricultural Engineering, believes that the improved methods of propagation of rubber trees may help substantially to increase the expansion of commercial rubber-tree acreage in Central and South America. Already the new methods are being applied in many of the 12 cooperating countries.

Dr. André Dreyfus, Dean of the Faculty of Philosophy, Science, and Letters, and Professor of Biology at the University of São Paulo, Brazil, has recently arrived in the United States as a guest of the Department of State. From the first of April until the latter part of May his itinerary here, as presently planned, will include stops at Boston, Mass., Buffalo, and Rochester, N. Y., Ann Arbor, Mich., Chicago, Ill., Ames, Iowa, San Francisco and Los Angeles, Calif., Williams, Ariz., Carlsbad, N. Mex., Austin, Tex., and New Orleans, La.

Agriculture IN THE *Americas*

Vol. IV • APRIL 1944 • *No. 4*

Paraguay Improves Its Agriculture

Important in Paraguay's agricultural program is a supervised credit plan under which farm families can obtain loans from a Government-sponsored bank to improve their farms and farming operations. The author discusses this plan

by E. C. JOHNSON

Paraguay is primarily an agricultural country. Its land area of approximately 170,000 square miles is well adapted to agricultural and forest industry, and a large share of its 1 million inhabitants live on farms and obtain their income from agriculture. The cattle industry, which at present is the most important single agricultural enterprise, is organized on a large-scale commercial basis but much of the farming is carried on by small farmers who produce only small amounts of agricultural produce for sale. Consequently, they have relatively low incomes. Several programs are now under way to improve the income and standard of living of farmers, and of these a supervised credit program promises to be of major significance.

While progress is apparent, much of the agriculture in Paraguay is relatively primitive and there is considerable room for improvement. The number of cultivated acres per farm is small and much work is done by hand. Oxen now provide the main means of power and transport.

As the agriculture of the country shifts to a more commerical basis, roads must be improved, new outlets found for the crops, acreages per farm increased, and modern farm machinery introduced. A great deal of education among farmers will be necessary, and resources must be provided for the development of farms and purchase of livestock and equipment. This fact is recognized by the agricultural leaders, and recently a program of supervised credit, which in reality is an educational program backed by the power of credit to obtain action, has been established under the *Banco Agrícola del Paraguay*, the agricultural bank in Paraguay.

An Old Institution

The *Banco Agrícola* is an old institution in Paraguay. Established in 1887, its services have been available to the farmers for a long period of years. On the whole, however, its loan activities have been on a comparatively small scale, which is explained in part by limited resources and the fact that a primitive, more or less self-sufficing type of agriculture does not use much credit. The *Banco Agrícola* is strictly a Government institution, all the capital stock being held by the Government of Paraguay, and under its charter of 1940 has very broad powers. Under this charter it is directed to promote and develop agriculture, stock-raising, and industry in general. The bank also has authority to make loans to farmers, cattlemen, and operators of industries and to engage in various banking activities including the acceptance of both demand and saving deposits. Loans to farmers may be made for many agricultural purposes on personal endorsements, pledges, or mortgage security. Actually, the granting of loans is only one of many activities among farmers.

The offices for official grading and classification of tobacco and cotton are under the *Banco Agrícola* and it purchases and sells to farmers farm supplies, farm tools, and machinery. Also, it purchases farm products for the account of the Government under a price stabilization program and in this manner the farmer is assured established minimum prices for several major farm products. Besides its operations at the headquarters in Asunción, the capital of Paraguay, the *Banco Agrícola* operates through thirteen established branches in cities and villages throughout the country and in addition has correspondents at several points. Farmers' supply departments are maintained at all branches and many warehouses are operated for storage of staple farm com-

---

The author is on the staff of the Farm Credit Administration, U. S. Department of Agriculture. Following a study of agricultural credit in Paraguay during the summer of 1943, Dr. Johnson took an important part in drawing up the legislation upon which Paraguay's new supervised credit plan is based. For further general information about Paraguay, reference is made to the back cover of the July 1943 issue of *Agriculture in the Americas.*

modities. Improved warehouse facilities for such storage are greatly needed, however.

Oxen provide power and transport for agriculture.

Need for Improved Methods Recognized

During the late months of 1943, the Minister of Agriculture and the directors and officers of the *Banco Agrícola* gave serious consideration to additional programs which might be developed for improving the farms of Paraguay and increasing the earnings of the people on the land. They recognized the desirability of adopting more modern techniques in the operation of farms and in improving home practices. Further, they realized that these improvements could come only through education and training of the farmers and their families and by providing resources which would enable willing and deserving farm families to adopt the better practices. Careful study of the problem finally resulted in a recommendation for establishing under the Minister of Agriculture and the *Banco Agrícola* a program of supervised credit as an aid to farmers of low income and limited resources in improving their situation. The program received the support of the Government and was authorized by a decree law on December 21, 1943.

Loans under the supervised credit program will be available to agriculturists who are heads of families and who have farming experience but are not in a position to obtain ordinary credit for improvement of their farm and farming operations. The persons receiving loans will be given assistance by rural supervisors in organizing the farm and in planning the operations. Rural supervisors, in other words, will be carrying out a program in agricultural education among a selected group of farmers, whose farms in turn will serve as demonstrations to encourage neighboring farmers to adopt improved methods. Also, it is contemplated that women will be appointed as home demonstration agents to assist in home improvement among the cooperating families.

Loans under this new program are authorized for several purposes but all must be secured by real estate or chattel mortgages. Loans to finance current farm expenditures, including subsistence of the family during the production period, are limited to a maximum period of one year with the rate of interest fixed at 7 percent. Similarly, loans for the purchase of equipment and for repairs may be made for periods up to 5 years with a rate of interest of 7 percent and may be made to farmers individually or to a group of farmers. Provision is made for loans for development of small livestock farms with rates of interest set at 6 percent and 10 years the maximum period of the loan. Loans for the purchase of additional land and for construction of new farm buildings will carry an interest rate of 6 percent with maturity dates up to 15 years. The decree law also provides for loans to farmer cooperatives, which at present are practically unknown in Paraguay but which in the future perhaps can be developed to aid farmers in various ways.

Two Important Problems

Officials in charge of the supervised credit program under the *Banco Agrícola* face two important problems: First, obtaining necessary capital, and second, training rural supervisors and home demonstration agents. The capital authorized under the program is 20 million guaranies (approximately $6,600,000), but this capital will be kept separate from the regular capital of the bank. Only a small fraction of the capital, approximately 1.8 million guaranies (about $581,000), is available to initiate the program. Therefore, sources of additional capital must be developed. Since this is a program for social improvement, the administrative expenses in carrying it out will be paid directly by the State.

The success of this program in improving farm conditions in Paraguay will depend to a large degree upon the ability of men and women selected as supervisors to work with the farmers and their families. Rural supervisors must have good practical experience in farming, must understand improved farming practices, and must be able to work satisfactorily with the farmers in teaching these practices. In training supervisors, Paraguay has the assistance of agricultural technicians from the United States who are members of the staff of the *Servicio Tecnico*

Many of Paraguay's farmers will be able to improve their dwellings through greater use of credit.

Inter-Americano de Cooperación Agrícola. This is an agency under the Ministry of Agriculture to engage in projects for improving agriculture. Several members have had experience in supervised credit in the United States and will be of great help in developing the supervised credit program. The agency is establishing an Agricultural Experiment Station near Caacupé which will carry on research and demonstrations on farm practices that will be very helpful in the general program for agricultural improvement.

Agriculturally Adapted

The ultimate possibilities of this new credit system in Paraguay may perhaps best be judged by some pertinent facts about the country.

Paraguay is an inland country, its main outlet to the sea being through Argentina over the Paraguay and Paraná Rivers. The Paraguay River runs south through the country and divides it into two rather distinct areas. The area west of the river is largely a low-lying grassy plain with cattle-grazing the principal industry. The area east of the river, where approximately 90 percent of the population lives and where most of the farming is carried on, is a region of alternating grasslands and forests. Only part of the fertile land in this area is now used for crops, which indicates possibilities for expansion in crop production. And Paraguay with climate and rainfall favorable to the growing of a great variety of crops, is looking ahead to more complete utilization of natural resources for increased production of certain agricultural products for export as well as for domestic consumption.

Manufactured and industrial goods must be imported from other countries, and to obtain the exhange for the purchase of such goods, exports are necessary. Since the economy of Paraguay is primarily agricultural, the products of cattle ranches, farms, and forests now constitute, and will no doubt continue to be, the leading exports. With costs of transportation to world markets relatively high, however, exports from Paraguay to a large degree must be confined to those products which have high value in relation to bulk.

This resort-like set-up is none other than the headquarters of a large cattle ranch in Paraguay.

Most of Paraguay's some 4 million head of cattle are produced on large ranches. Livestock, other than cattle, are relatively unimportant, but since corn can be produced to advantage for domestic use, hog production particularly may offer profitable opportunities.

Paraguay has approximately 4 million cattle. Credit will help many farmers to improve their cattle for higher dairy and beef production.

Wide Range of Crops Produced

Cotton is a leading crop. Most of the fiber is exported to neighboring countries but the seed is used for oil, all of which is consumed in Paraguay. The Paraguayan Government at present is making a special effort to introduce seed for the production of cotton fiber of longer staple and improved quality. Tobacco has long been an important crop for export but has declined relatively in recent years. Rice and sugarcane are increasing in acreage and in total production. The production of yerba maté, a native herb from which a beverage is made, has been a leading industry for many years. The yerba maté tree grows wild in forests of eastern Paraguay and from its leaves the beverage is produced. Much of it is consumed in the country but exports are important.

The production of various crops for oil is a growing industry and increased production is encouraged by the Government. Exports of castor oil from castor beans, and coconut oil from the coconut palm, which grows in many regions of Paraguay, are increasing rapidly. The acreage of peanuts for oil is expanding under a program sponsored by the Government, and production of sunflowers for oil, as well as tung trees for tung oil, offers possibilities for profitable development. An essential oil distilled from the leaves of the bitter orange tree and used in perfume and pharmaceutical industries, has been an export commodity for over a century.

The forests of Paraguay produce a great variety of hardwood trees of commercial value. Most noteworthy is the quebracho tree from which quebracho extract for the tanning industry is manufactured and exported.

(Continued on page 78)

Flowers That Fight Malaria

A member of the chrysanthemum family has gone to war in the form of pyrethrum bombs which are used to kill malaria-carrying mosquitoes. The author here discusses pyrethrum production, particularly in the Sierra of Peru and Ecuador

by RAYMOND E. CULBERTSON

the United States Army asking for many millions of pounds of flowers, pyrethrum has become a strategic war crop. Recent developments have made it highly effective in combating the insect enemies of our troops—flies, fleas, body lice, and, most important of all, the yellow fever- and malaria-carrying mosquitoes. The success of many battles has hinged on the effectiveness of malaria control. In the battle for Sicily, for instance, more of our soldiers were put out of commission by malaria than by weapons of the military enemy. Where troops are quartered in highly malarial areas, as high as 20 percent may contract malaria in one night if unprotected from mosquitoes.

The insect-killing pyrethrum bomb is relatively new and certainly timely in its appearance. Now carried by our troops as regular equipment in malaria-infested areas, this bomb is light in weight and contains a solvent under a pressure of 90 pounds per square inch at room temperature. The insecticide is released from the bomb as fog through a valve. A 3-second application is sufficient to give permanent paralysis to all insects in an ordinary-sized room, and there is enough "fog" in an 18-ounce bomb for about 200 such applications. The stuff is noninflammable, nonpoisonous, leaves no oil residue, and is harmless to man and beast. It is particularly effective for fumigating airplanes and tents. When war demands lessen so that adequate supplies can be made available for civilian use, this product is certain to contribute much toward greater comfort and better health for both indoor and outdoor living.

Before its recent development as an insect-killing bomb load, pyrethrum was commonly used as the base for household and livestock sprays and was employed extensively in dusting powders and agricultural insecticides. Whether the subject is a sucking or chewing type of insect, death comes by paralysis—and they stay paralyzed.

Pyrethrum consists of the dried flowers of an herbaceous perennial, *Chyrsanthemum cinerariaefolium*, which grows to a height of from 18 to 30 inches. The plant is tufted and may bear anywhere from 50 to 500 or more white flowers. These flowers, with their yellow centers, contain the insecticidal principle.

The pyrethrum plant is native to Dalmatia, now a part of Yugoslavia, but the largest producing areas in recent years have been Kenya Colony in East Africa, and Japan. The plant is adapted to temperate zones and, when grown elsewhere, difference in latitude must be offset by a difference in elevation.

With the Japanese supply cut off, and the Kenya crop failing to meet increased wartime demands, new sources of supply are imperative. A study of new areas for pyrethrum production indicates the Sierra of Peru and Ecuador to be one of the most promising.

Pyrethrum in Peru

Fortunately, some work had been done on pyrethrum production as early as 1928 by private interests in Peru and later, in 1933, by La Molina Experiment Station. Largely through the efforts of J. Alcides Ocampo, of the *Ministerio de Fomento*, pyrethrum plots were established at the various experiment stations throughout the country. These have now been under observation sufficiently long to indicate where this vital crop is best adapted.

U. S. D. A. Photograph by Knell

"Bombing" mosquitoes! In 1 night as high as 20 percent of the soldiers in a malaria-infested area may contract the disease if not protected.

The author, now on the staff of the Office of Foreign Agricultural Relations, was with the National Research Council for 9 years, during which time he conducted research on pyrethrum in the United States to determine where that crop could best be grown. During the past year Dr. Culbertson spent several months in Peru and Ecuador in the interests of increased production of pyrethrum.

Peru has three climatic zones. From west to east, there is the coastal zone, which is a warm, dry, largely desert region; the Sierra comprises the main ranges of the Andes with their valleys and lofty table lands; and the Montaña extends down into the tropical conditions of the Amazon and its tributaries. Of these three zones experiments show that pyrethrum is adapted only to the Sierra, and there at elevations above 5,000 feet. Plantings were successful at 11,000 feet, the highest elevation at which test plantings were made.

Proof beyond doubt has been established that pyrethrum can be grown successfully in Peru. Its culture has passed the experimental stage, and commercial production is now under way. The best growing areas are in the vicinity of Huancayo, Concepción, Huánuco, and Huarás. The Cusco-Puno area is also apparently suitable. The Huancayo Valley, with 200 acres, has taken the lead in pyrethrum production.

The Huancayo Valley may well become the center of pyrethrum culture in Peru. Both the soil and climate here seem to be ideal. Average annual rainfall is 40 inches; average temperature is 54° F., with only slight variations above or below this figure; the elevation is 10,700 feet. The city of Huancayo, with nearly 29,000 inhabitants, is of considerable historical interest. Located on one of the imperial highways of the Incas, it has on three different occasions been the capital of Peru. With its famous fairs, colorful Indians, and fine native shops, it is one of South America's most picturesque cities.

A pyrethrum field in full bloom at the Agricultural Experiment Station, Concepción, Peru.

Unselected pyrethrum grown in Peru equals that produced in the United States, Japan, or Kenya Colony. Analyses for pyrethrin content (potency is expressed as pyrethrins) have been made since 1937 and the market may be assured of 1 percent flowers from Peru. Flowers grown at Lima (elevation 512 feet) averaged 1.04 percent pyrethrin; Arequipa (elevation 7,579 feet), 0.97 percent; Ayacucho (elevation 9,065 feet), 0.99 percent; Huarás (elevation 10,141 feet), 1.04 percent; Matucana (elevation 7,838 feet), 1.11 percent; Huancayo (elevation 10,696 feet), 0.96 percent; and Concepción (elevation 10,669 feet), 1.06 percent.

Before the war the United States bought pyrethrum flowers from Japan on the basis of 0.90 percent total pyrethrins. Flowers from Kenya Colony are sold on the basis of 1.3 percent pyrethrins. The Kenya flowers, however, are not only from selected plants but are carefully harvested, dried, sorted, and packed.

Pyrethrum in Ecuador

Pyrethrum culture started in Ecuador in 1940, when seed samples were sown at the experiment stations at Ambato and Alausí. During 1943 some 60 acres were planted for commercial production and various small plots were established throughout the Sierra of Ecuador. Flowers from Alausí analyzed 1.11 percent pyrethrins, which, by prevailing standards, is excellent quality. Since elevation, soil, and climate are very similar to those of Peru, there is every reason to expect that pyrethrum will do well in Ecuador.

How to Grow the Plant

The pyrethrum plant is a perennial, flowering for several years beginning the second year after planting. For the first season, the procedure in growing pyrethrum is much like that for growing tobacco. Seeds are sown in well-prepared and fertilized seedbeds, usually broadcast at the rate of 1 ounce of well-cleaned seed to 60 square feet of plant bed. About 240 square feet of bed should be allowed for each acre of land to be planted. After the seed is raked in, the ground is firmed gently and then mulched with rye straw, coarse hay, or similar mamaterial, and is sometimes covered with muslin. Under ideal growing conditions, plants are ready to transplant in about 10 weeks, while under more unfavorable conditions 6 months or more may be required to develop plants to the transplanting stage.

Pyrethrum seeds are very small, there being about 29,000 to the ounce. Germination of heavy well-cleaned seed usually is between 40 and 60 percent.

After the first season pyrethrum may be propagated by dividing the old plants and setting out the plant divisions. This practice is discouraged, however, for several reasons: Production from the old planting is entirely lost; lifting and dividing the plants is a costly operation; mortality is high; and yield is lower than with seedlings.

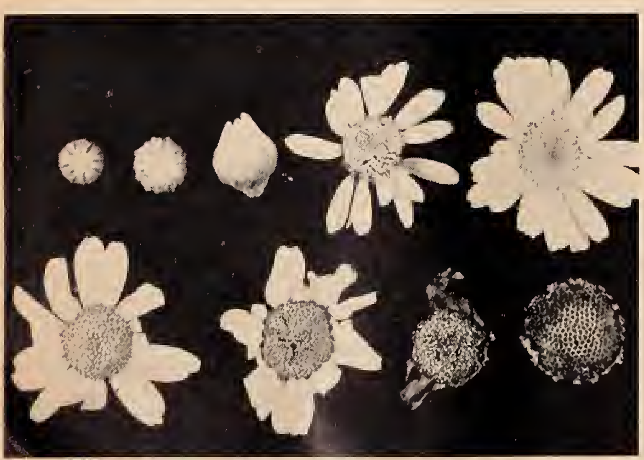
Since pyrethrum is a perennial lasting from 6 to 8 years or more, care should be used in locating the plantings. Low-lying fields should be avoided because one of the first requirements is good drainage. Gently rolling land is satisfactory. The crop is clean cultivated and should be planted on the contour whenever possible. If planted in rows up and down hill, the soil will wash badly. By alternating pyrethrum with strips of grass on the contour, however, rather steep slopes may be utilized. On the steeper slopes, mulching with coarse hay or straw between the rows is suggested.

Sod land is preferred to cultivated land, and it should be prepared as for corn or any other row crop. Under irrigation, ridged rows should be thrown up 27 to 30 inches apart and the plants set on top of the ridge rather than in the bottom of the furrow. Observations show that where plants are set in the furrow and soil thrown up over them there is excessive disease and rotting of the crowns.

Transplanting is ordinarily done by hand, using a dibble or trowel. Where a dibble is employed, a hole is punched in the ground, a plant placed with its roots spread out well in the hole, and the ground closed in by inserting the dibble adjacent to the roots. It is imperative that all space around the roots be completely closed and that the crown be left uncovered. Plants are usually set 15 to 18 inches apart in 27- to 30-inch rows. This permits from 11,614 to 15,560 plants to the acre.

The pyrethrum plant produces no flowers the first season after planting. In the second and subsequent seasons, the flowers should be harvested when the white petals are horizontal and when about one-half to three-fourths of the disc (yellow center) florets are open in a majority of the flowers. This is extremely important from the standpoint of both weight and pyrethrin content.

In areas of high altitude near the Equator, pyrethrum fields have a tendency to bloom from 6 to 9 months. Under such conditions it is necessary to pick the flowers by hand, going over the field almost daily in order to gather the flowers at the right stage of development. In areas where most of the flowers bloom about the same time, the flower stalks may be cut near the ground with a sickle and the flowers removed by means of a power-driven revolving cylinder. A broomcorn cleaner may readily be adapted for the purpose.



Stages in floral development of pyrethrum. The flowers should be harvested when one-half to three-fourths of the yellow disc florets are open as shown in the lower left-hand corner.

The flowers can be dried either in the sun or in the shade, but the usual method is to start the drying process by first leaving them in the sun for a few hours and then finishing in the shade. Artificial drying is also possible, using a temperature of not more than 140° F. In any event, care must be exercised to prevent overheating or discoloration. In being laid out to dry, the flowers are usually piled 2 or 3 inches deep on tarpaulins, special racks with cloth or wire screen bottoms, or on ordinary flooring. They must be stirred frequently for several days, preferably with a large-toothed rake. The flowers lose about 75 percent of their weight in drying and can be considered thoroughly dry when they snap upon being broken between the fingers.

Storage is an important feature of pyrethrum production, especially if a considerable acreage is grown. The flowers should be kept in a dry place and preferably in tight bales should they not be marketed at once.

Depending upon the age, stand, soil fertility, and care, pyrethrum yields have ranged from 400 to 1,200 pounds of dried flowers per acre. Under favorable conditions the plants will yield profitably for 6 or 8 years.

Like virtually all plants, pyrethrum is subject to certain fungus diseases, the most important being caused by species of *Sclerotinia*, *Rhizoctonia*, and *Fusarium*. Under favorable climatic and soil conditions, however, these are not generally serious. Losses more frequently result from poor drainage and from covering the crowns with soil. The first and last rule in the successful culture of pyrethrum is to keep the crowns dry.

Inasmuch as the supply of pyrethrum seed is very limited, local production of seed might possibly be advantageous. This can be done by simply delaying harvest by about 4 weeks. In the process of ripening, the heads turn brown, the corollas of the disc florets drop off, and the seeds are left in the receptacle. For seed, the heads should be harvested as soon as a small percentage of them begin to shatter. The heads may be gathered by hand but it is better to cut the stalk and all off, and make them into sheaves. After thorough drying, the seed may be threshed out mechanically or flailed, after which it can be cleaned like any other small seed.

Much of the seed on the market is improperly cleaned and of low germination. And, as for almost all crops, seed of low viability or dirty seed can be very disheartening to the would-be producer. Thus the importance of buying or producing seed of high quality cannot be overemphasized.

A start has been made in pyrethrum-growing in the Sierra of Peru and Ecuador. Greater acreages of this complementary nonperishable cash crop should be encouraged. Greater supplies of it are needed by the United States and wider use could well be made of it by countries of origin to eliminate noxious insects.

Henequen From Cuba

The war in the Pacific has increased the need for fibers from Latin America. This is a story about henequen growing in Cuba and some of the problems related to increased production of this fiber-producing plant

by ALLEN H. LESTER

Where tropical Cuba's soil is rocky and unsuited to sugarcane, the sword-like fiber-producing henequen plant finds a satisfactory place to take root. On plantations centered largely in the north of Matanzas Province, little more than 100 miles from Key West, this native plant of the Americas has been supplying a hard fiber which can help in some ways toward offsetting our black-out of Manila hemp and other fibers from the Far East. Binder twine for harvesting machines was the chief product made from henequen in the past, but it has also been used for small rope, wrapping twine, bags, burlap, and other purposes from scouring pads for the kitchen sink to shoes.

The Island of Cuba now produces an eighth of the world's henequen, on between 35,000 and 40,000 acres, and it could produce much more. Mexico, on some 445,000 acres which lie largely in the States of Yucatán and Campeche, grows practically all the rest.

The acreage devoted to henequen production, of course, hinges on prospective financial returns. If plantation owners in sugar-dominated Cuba were to find it financially profitable to increase and maintain production of henequen, the disadvantages of a one-crop economy could perhaps be avoided.

History of Henequen

Henequen suckers from Yucatán, Mexico, are said to have been brought to Cuba by one of the royal governors while the country was still part of the Spanish Empire. The plant is believed to be native to Yucatán, where its fiber seems to have had an important place in the ancient Indian civilizations which flourished there. An eighteenth-century account of early culture says of the agave, the group of plants to which henequen belongs:

"From it the ancient Mexicans fabricated their thread and cordage, mats and bagging, shoes and clothing, and webs equivalent to cambric and canvas; the hammocks in which they are born, repose and die; the paper on which they painted their histories, and with which they adored and adorned their gods. . . . It is not, therefore, surprising that the ancient Mexicans used some part or preparation of these plants in their civil, military and religious ceremonies, at marriages, deaths . . . ."

About the middle of the nineteenth century, sugar plantations in Cuba were growing some henequen for local use, such as crude rope for pulling the cane carts, but Cuba's first commercial plantings were made in 1890. An interesting development since 1925 is the fact that at least two sugar companies have started henequen plantations to diversify production and to enable them to utilize sugar workers during the 8 or more months of the year when the sugar mills are not grinding. Today, around three-fourths of Cuba's henequen is produced from only a few Cuban-controlled plantations.

The botanical name of the henequen plant which is the source of practically all the so-called "sisal" of

Henequen will grow on rocky land that is unsuited for sugarcane.

The author, an agricultural economist with the Office of Foreign Agricultural Relations, based this article largely on a report submitted by Charles W. Smith of the United States Embassy at Habana, Cuba.

Cuba and Yucatán is *Agave fourcroydes.* The true sisal plant, *Agave sisalana*, is cultivated principally in East Africa, the Netherlands Indies, and Haiti. A closely related plant, *Agave letonae*, produces the "sisal" fiber of El Salvador. The fiber produced by these three different plants is ordinarily known in the fiber trades a "sisal."

From Planting to Harvest

A henequen field is not hard to plant, for plowing is not necessary. The workers simply go over the prospective field swinging their machetes to cut off the brush and tall grass. Then they mark off long rows 8 to 9 feet apart and, with pick and shovel, dig holes 4 to 4½ feet apart in the rows. In each hole they plant a henequen *hijo*. In Cuba *hijo* generally means son, but in this case it means a sucker from a green plant.

When the sucker takes root and grows, it sprouts rapier-like leaves straight up from its top. As new leaves shoot up from the center of the plant, the older ones are forced farther and farther away from a vertical position. Thus, in harvesting, the leaves at the bottom are cut first because they are the first to mature. This process of new leaves growing up through the center of the plant continues during its lifetime. As successive cuttings continue to be made from the bottom, a trunk develops, like that of a palm. When at last a stem, or "pole," shoots up instead of another leaf and bears pale yellow flowers, the plant has reached the end of its rope production, so to speak. When all leaves previously sprouted have grown to harvestable size, the plant is stripped of them and dies. The average life of a henequen plant in Cuba is 15 years, with a producing or "cutting" period of about 11 years. While some plants do not come to maturity as early as others, they tend to live correspondingly longer and thus round out their usual 11-year production span.

In Cuba the henequen plant is ready to contribute its first fiber about 4 years from the planting of the sucker. Harvesting is not begun until at least 12 leaves have matured. Some plantation owners who harvest annually rather than semiannually await a crop of 25 leaves on a plant before cutting. Because 16 or 20 leaves must be left on the plant if it is not to be damaged, some 30 or 40 leaves in various stages of development may be on the plant at first harvest.

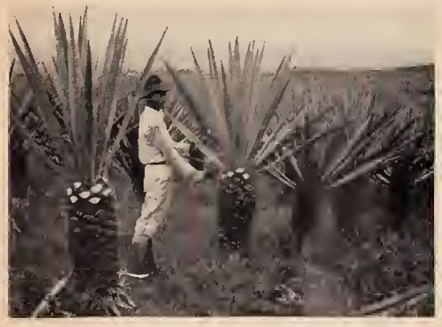
In harvesting, the worker, wisely wearing gloves to guard against the sharp thorns and spines, cuts with a 9-inch knife the lower leaves as close to the trunk as possible but lets the upper leaves remain. He slashes off the sharp point from each leaf and ties the leaves into bundles of around 25. A bunch like this will weigh about 45 pounds. As the worker's pay, in pesos, depends upon the number of leaves he gets ready for carting to the mill, each worker keeps his stack of leaves separate. When he has four bundles cut and tied, he carries them over to the road. The four bundles together weigh 180 pounds, and to transport them he uses a carrying bar across his shoulders, Chinese style, with two bundles suspended from each end of it. To take this load over uneven ground, between rows containing hundreds of needle-like points on the growing plants, is a task requiring real dexterity. A two-wheeled oxcart or a truck will come to collect the piles at the roadway and haul them to the processing plant or to another collection point on a narrow-gage railway, which in turn takes them to the centrally located mill or decorticator.

Separation, Drying, and Baling

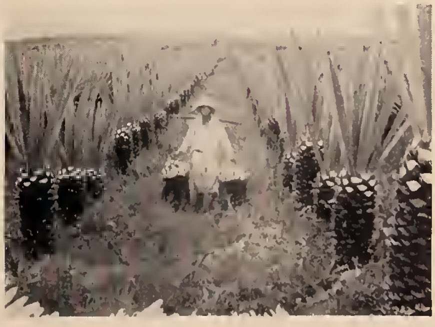
The leaves weigh approximately 30 times their fiber content. The fiber must be separated from the pulp, which, up to the present time, has no commercial value. The efficiency of the separating and drying operation affects both the quantity and unit value of the finished product.

In the early 1800's, when henequen in Mexico's Yucatán peninsula was beginning to indicate possibilities for export use, the cleaning process used there was very primitive. The Mexican Government is said to have offered a prize for a faster method of processing, as a result of which a Franciscan friar invented a *raspador*, or separator, which made possible the gradual development of the industry. Machines used today operate on much the same principle as pioneering ones, but they are decidedly more efficient.

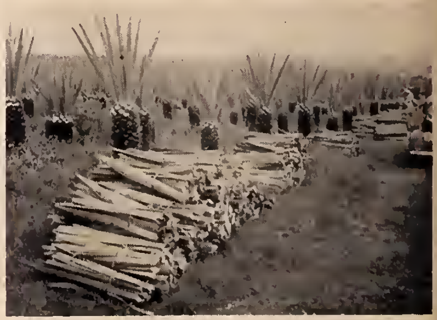
In modern decorticators rotating drums scrape the



After the sword-like leaves have been harvested with a machete . .



they are bundled and carried "Chinese style" . . .



to the roadside where they are stacked ready to be picked up later.

pulp from the leaves as they pass through the machine in the firm grip of endless chains. The cleaned fiber comes out of the end of the decorticator doubled over a brass rail. It slides down the rail to the ground level and is laid over wooden poles on a car or cart to be taken away for drying. Mules are commonly used to pull these vehicles and they become so familiar with the routine that they do the job without any guidance.

The strands are unloaded from these cars onto wires or wooden poles to dry under the tropical sun. One sunny day on these drying racks is enough. Then the fiber goes under cover and is baled in about quarter-ton units. The bales are usually tied with henequen cord, woven locally by hand.

The discarded pulp, or bagasse, as it is called, is so strongly acid that the parts of the machinery with which it comes in direct contact have to be made of copper, bronze, or brass in order to resist corrosion. Bagasse will kill a growing henequen plant if placed on it, or even if placed on nearby ground in full strength.

Production—Trends and Reasons

For the 5 years ending with 1941, production of henequen in Cuba averaged about 33 million pounds per year. The year 1940 with nearly 38 million pounds was an all-time peak. But in 1941 only 27 million pounds were produced. Since Cuba has ample good henequen land to support an enormous increase in production, an inquiry as to why this drop occurred is justified.

Too heavy cutting in 1940, although it made that year's crop the largest ever, accounted partly for the decline in the next year. Some 12 to 15 leaves can be cut from a mature henequen plant every 6 months, leaving sufficient foliage on the plant to keep it growing well for subsequent cuttings. If more are taken, however, not only are fewer available for harvesting next time, but the plant itself is weakened for awhile and may even die. Therefore the effect of overharvesting in 1940 was an important factor in lowering the next crop.

Another reason was delay in harvesting, which resulted in considerable spoilage of leaves.

A further factor in the drop—a factor that is also fundamental in its bearing on long-term prospects of Cuban henequen production—is that new plantings had not been maintained in the past at a rate sufficient to replace over-age plants. Since henequen dies at around 15 years after planting, the planter must keep setting out new suckers in order to maintain volume of production. The new ones do not come into production for approximately 4 years. Managers of plantations must have lacked conviction that sound financial planning warranted replacement of dying plants, perhaps because of uncertainty about prices during the producing life of new plants and about the rising costs of labor. The same reasons apply to cautiousness about planting entirely new fields to expand production. As the grower cannot stop harvesting during a period of low prices without damaging his plants, he must weigh carefully the long-range outlook before making his commitments.

After henequen has been decorticated, one bright day under the tropical sun is sufficient for drying.

Some companies probably do not use the best production methods. To attain maximum yields from their plantations, they must, for instance, properly supervise the laborers so that certain short cuts which may be wasteful, or detrimental to sustained yield, will not be used. The laborer, paid on a piece-work basis, naturally would prefer not to cut from plants which have grown so close together that the sharp spines prick him and slow down the work, or from plants in sections where the ground is unusually rough so that carrying the leaves to the edge of the field takes longer. Unfortunately, if the leaves are not cut when mature or within 6 months thereafter, the plant's life is shortened because it goes to seed faster than usual. Likewise, the workers naturally may tend to take too many leaves from the more accessible plants, although overcutting these would bring more spot cash on a straight piece-work basis.

Another factor in management methods is the control of disease and of the *Max* beetle. The considerable success of some growers in forestalling damage from these hazards shows that such losses may be prevented. The *Max* beetle favors the henequen flower as a place for mating, then starts its damage by laying eggs in the leaves of the plant. The grubs which hatch from the eggs bore toward the heart of the plant and eventually kill it. Plantation workers actively combat the pest by lopping off the poles before they flower and by cutting and burning the trunks of infested plants.

The fact that many fields which would require high cost of production now lie idle is another reason why maximum production is not being attained. When part of the plants in a field have died, harvesting becomes more costly, and if new plants do not replace the old, the field eventually becomes unprofitable and is left to die out.

Our Stake in Cuba's Exports

Before the outbreak of the war in the Pacific, trade in Cuban henequen was not particularly important to the United States supply of cordage. Nevertheless, until 1937, when Germany started purchasing Cuban fiber, this country had taken practically all Cuba's exports of henequen—both fiber and manufactured products. For the 5 years ending in December 1941, despite the German buying, which was cut off in 1939, an average of nearly four-fifths of Cuba's exports of henequen came to the United States as raw fiber or rope and twine. This amounted to about two-thirds of the volume of Cuba's henequen crops during the period. Even in the record Cuban crop year of 1940, however, the volume of henequen and its products which Cuba shipped us was less than one-sixteenth of all raw vegetable fibers other than cotton which we imported that year.

With the loss of Far Eastern sources, quantities of cordage and rope-making fibers which were considered small in pre-war days became of crucial importance. Thus the Cuban trade became vital to us, even while Mexico, which supplied six-sevenths of our imports of henequen and its products before the war, continued dominant in our supply.

In 1940, the year of the bumper crop of 38 million pounds of henequen, Cuba exported a total of over 34 million pounds of the raw and manufactured product. In 1941, when the production was only 27 million pounds, Cuba exported a total of about 24 million pounds. This decline in exports reflected both the fall in production of henequen and domestic shortages in Cuba of normally imported products of other fibers. Prices for henequen manufactures are often higher in the local Cuban markets than in export trade to the United States.

In 1940, 97 percent of Cuba's total exports of raw and manufactured henequen came to the United States. In 1941 that percentage dropped to less than 90. This drop may be attributable to fiber shortages in other countries, which stimulated demand for the Cuban product.

The Outlook and Its Problems

What, then, are the prospects for Cuban production of henequen in coming years?

Of immediate importance are any steps which may be taken to increase production during the near future to meet current war needs. Because new plantings made now would not influence the crop for the next 4 years, the way to get more production at once is to increase harvestings from plants already in the ground, as far as this can be done without harming future production.

By continuing to contract at good prices for all of Cuba's excess production of fiber, the United States Government can at least make sure that growers have the basic incentive toward getting full production from existing plantings. It can make technicians available to keep the growers in prompt touch with the latest techniques for getting maximum production. The extent to which the growers respond will depend partly upon the spread between the contract price and the cost of production. Response can also depend upon the extent to which the individual plantation owner is made acquainted with the significance to the war effort of the last ounce of his output.

The share of Cuba's henequen which comes to the United States, whether raw or as cordage, depends in part upon Cuba's own requirements and upon needs of other countries for the available supply. Technicians cooperating with Cuba to interchange accumulating information about substitute materials, therefore, might be helpful toward putting the Island's available cordage material to maximum anti-Axis use.

The problem of increasing henequen production over a long period hinges on the prospects of its being a financially sound investment. Although rising prices may have enabled growers to absorb at the moment the rising cost of labor and of minor production factors, uncertainty about the future seems to hinder expansion for post-war competitive markets. Because new plantings would not produce for 4 years but would thereafter average 11 years of production, a grower who plants now is speculating on the costs he will have and the prices he will get during the period from 1948 to 1959.

A report on Cuba's economic and social problems in 1934 was made by a Commission on Cuban Affairs, assembled by the Foreign Policy Association at the request of the President of Cuba. It recommended that the Island develop products to decrease its enormous dependence on a prosperous sugar market and to provide employment for its workers during the major part of the year when sugar mills are not running. Diversification is today the central theme of Cuba's agricultural policy. Fiber crops are among the non-competitive or complementary crops of which Latin American countries may increase production and exports to the mutual advantage of hemispheric interests.

Whether costs of production will enable Cuba to compete successfully with other countries in long-run peacetime fiber production is a question not yet settled by growers, upon whose decision permanently increased production will depend. Perhaps they feel that the Yucatán region of Mexico may have a cost advantage enabling it to supply any future needs. Or, conversely, perhaps they will come to feel that they have methods which will make Cuba fully competitive in henequen markets of the post-war world.

If future competitive abilities of Latin American countries can be anticipated and efforts at hemisphere production of complementary products, including henequen, can be guided so that a minimum of waste effort will occur, the benefits that will result are obvious.

A herd of purebred Holstein-Friesian cattle graze on a dairy farm of the Bogotá *Sabana.*

Dairy Cattle of Colombia

The Republic of Colombia normally imports some dairy products each year to meet domestic needs. The author here discusses Colombia's dairy problems and what is being done about them toward providing a self-sufficient dairy industry

by R. E. HODGSON

Cattle are of major importance in Colombian agriculture and their importance will increase as agriculture in general develops. Cattle raising not only supplies dairy products and meat but also helps to balance the agricultural industry and to conserve the soil resources of the nation. In farming areas near the large cities, where the demand for milk and milk products is growing steadily, dairy farming is forging ahead of other livestock enterprises.

Colombia imports some dairy products each year to meet its needs, but milk production has increased significantly during the past decade. Still greater increases may be expected in numbers of dairy cattle and dairy farms and in production per cow as dairymen adopt better breeding, feeding, and management practices. National interest in the dairy industry is growing, as is indicated by Government-sponsored research and education on the subject. The Government aids in importing superior dairy breeding stock and in developing marketing agencies. The *Asociación de Ganaderos* and similar organizations contribute to the development of the dairy industry through livestock-improvement programs.

Good agricultural areas are found throughout Colombia, under tropical, subtropical, and temperate conditions. Some of these areas are isolated by rugged mountains that make communication with other areas difficult. This has limited the exchange of breeding stock and transportation of agricultural products from areas of surplus to those of scarcity.

Some Dairying in All Climates

Dairy farming is carried on to some extent under all the different climatic conditions in Colombia. The temperate areas, however, afford the best conditions for milk production. This is primarily due to the cooler atmospheric temperature, adequate water supply, and the relative freedom from the cattle fever tick. The high mountain valleys and plateaus in the Departments of Cundinamarca, Boyaca, and Santander are the principal

---

The author has spent approximately 1½ years studying typical dairying in Colombia and six other Latin American countries. Dr. Hodgson is on the staff of the U. S. D. A.'s Bureau of Dairy Industry and is at the present time preparing a comprehensive handbook of dairying for Tropical America. Another article by this author, "Costa Rican Dairyland," appeared in the November 1943 issue of *Agriculture in the Americas.*

centers of dairy and livestock farming under the temperate conditions. Dairying is most highly specialized in the Bogotá *Sabana*.

Dairy farming under tropical conditions is found along the north coast in the Department of Bolívar and around the cities of Barranquilla and Cartegena. The Cauca River Valley, particularly in the Department of El Valle, is an important livestock section where considerable milk is produced. This section offers good opportunity for future development.

The subtropical mountainous areas of the Departments of Antioquia, Caldas, Cauca, and Tolina provide extensive grazing for relatively large numbers of cattle. Milk and milk products are produced in these areas for the local populations.

It is estimated that the cattle population of Colombia is about 11 million head, of which perhaps 2½ million at least are cows for milk production. Most of these cattle represent the Criollo, or native, breed. The Colombian farmer likes good livestock and he has endeavored to improve his milk cows. Several improved types of native cattle have been developed that are adaptable to particular local conditions. In the Antioquia district the popular Blanco-Orejinegro appears to meet the needs of the local farmer. Likewise the breeders in the Cauca Valley, in the Department of El Valle, have developed a good milking strain of the usual fawn-to-red-colored Criollo.

In recent years purebred dairy cattle, notably of the Holstein-Friesian breed, have been imported from the United States and Europe for use in grading up the Criollo for higher milk production. The agricultural officials of the Colombian Government have cooperated with the breeders in this important work. Herds of purebred dairy cattle have also been established. Most of the imported dairy animals are in the higher altitudes, mainly in the Bogotá and Medellín areas, though good herds are occasionally found in the lower altitudes, as in the Cali Valley. The purebred herds are doing well where they are maintained under conditions of good feeding and management.

Two Chief Sources of Supply

The national milk supply comes from two sources—specialized dairy farms and the larger livestock farms. On the latter type of farm, milk is usually a byproduct of the main livestock enterprise. Nevertheless, the greatest proportion of the national milk supply now comes from this type of farm, but there is a trend toward specialized dairying. Milk production on these larger general livestock farms is high during the rainy season, or winter, and low during the dry summer season. This uneven production is a disturbing influence on the market and causes variation in the price received for milk. Also, milk from such nonspecialized livestock farms presents a serious problem in marketing because much of it comes from isolated rural areas, and considerable deterioration in quality takes place during the long haul to market.

A large part of the milk is made into cheese on the farm, which varies greatly in character and quality. This farm-made white cheese, *queso blanco*, must be marketed soon after it is made because it does not keep well. Moreover, this type of cheese does not cure in storage and, therefore, cannot be held for the more favorable dry-season market.

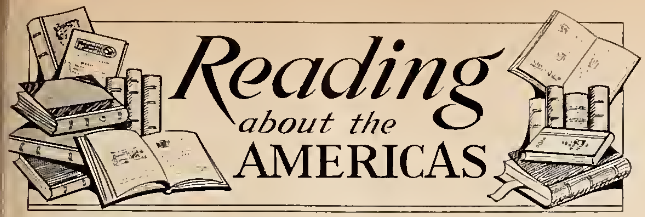
Some of the disadvantages of making cheese on the farm may eventually be overcome by changing to factory cheesemaking. This evolution of the cheese industry has begun in some areas and its benefits are already apparent. If cheese factories are located where producers can deliver their milk soon after it comes from the cow, the milk from several neighboring herds could be mixed and made into a uniform, high-quality, Cheddar-type cheese. Such cheese can be cured and held for sale when the price is most favorable and at the same time make a supply of cheese available the year round.

This Criolla-type cow (Blanco-Orenjinegro), all white except for the tips of her ears, was developed in the Departamento de Antioquia of Colombia.

Production and Marketing Problems

The efficient production and marketing of high-quality milk and milk products is one of the biggest problems confronting the Colombian dairy industry. Although a good start has been made, progress has been retarded by lack of facilities and by the limited technical knowledge of the problems involved in processing and distributing milk and its products. In addition, modern public health regulations to assure sanitary production, processing, and distribution of milk would be necessary to build consumer confidence in dairy products, to standardize the industrial methods, and to eliminate unfair trade based on low-quality unsafe products. Officials have

(Continued on page 78)



Reading about the AMERICAS

The Americas and Tomorrow, by Virginia Prewett. 292 pp.; Published by Blakiston Co., Philadelphia; Distributed by E. P. Dutton & Co., New York; 1944. The story of inter-American cooperation: How it grew, how it operates, and what it may mean in the future. A brief historical background sketch aims to give the reader a new understanding of the people and culture of Latin America. A candid discussion follows of early inter-American relations. The author then traces factually the Good Neighbor Policy—some of the problems involved and the circumstances back of various steps in its progress. From the Seventh Pan American Conference at Montevideo in 1933, the account moves swiftly through specific agreements and facts of international trade, to the Moscow Pact, and on to the question "What is Latin America's place in the peace of tomorrow?"

Rebellion in the Backlands. 526 pp.; University of Chicago Press, Chicago, Ill. This is the recent translation into English, by Samuel Putnam, of *Os Sertões*, written in Portuguese in 1902 by Euclides de Cunha. It is the story of the gathering of 500 people of Brazil's backlands in 1897 around their prophet "Antonio the Counselor," and of the expedition of 5,000 Brazilian soldiers sent to quell the movement. The book gives not only many particulars of Brazilian history, climate, geography, racial characteristics, and national psychology, but also some of the social problems involved in the growth of a country. One well-known Brazilian writer of today calls *Os Sertões* "our greatest classic," the book in Brazilian literature to be chosen for translation into other languages as being most "representative of my country and my people." Another Brazilian writer says of it: ". . . notwithstanding its being a nonfiction book . . . our greatest and most impressive novel."

Labor Trends and Social Welfare in Latin America—1941 and 1942, by Ernesto Galarza. 153 pp. (processed); Pan American Union, Division of Labor and Social Information; Washington, D. C.; 1943. Illus. This document is a survey of ways and means being used in Latin American countries to readjust to conditions imposed by the war. It includes such subjects as unemployment caused by closing of industries and ports; rising costs of living; surpluses and shortages of foods; difficulty of transportation; changed labor standards; and scarcity of materials.

Latin America and the United States, by Graham H. Stuart. 509 pp.; D. Appleton-Century Company, New York; 1943. Maps. Fourth edition, thoroughly revised. Its purpose is to give a survey of the diplomatic and commercial relations between the Untied States and the Latin American countries. It is designed both as a textbook and for general interest to "that part of the general public which is interested in the bases and development of American foreign policy." Two chapters have been added, one of which discusses the implementation of the Good Neighbor Policy. A supplementary reading list follows each chapter.

The Follett Spanish Dictionary, by Joseph G. Fucilla. 332 pp.; Follett Publishing Company, Chicago; 1943. A popularly priced, convenient-sized, bilingual dictionary. It is not designed to include complete vocabularies of either language but gives brief translations of the words and expressions in both languages that people must know to be able to read modern newspapers and carry on commercial correspondence. Many entirely new words have been added in the fields of science, engineering, arts, trades, and sports. Simple rules for pronunciation of Spanish words are given at the beginning of the Spanish section rather than a phonetic representation of pronunciation for each word.

Diccionario de Americanismos, by Francisco J. Santamaria. 3 volumes; Editorial Pedro Robredo; Méjico, D. F.; 1942. In Spanish. Not only gives explanations of terms but tells in which country they apply. It contains an index of common and scientific names of American flora and fauna.

Population (First Series), U. S. Department of Commerce. 12 pp.; U. S. Government Printing Office, Washington, D. C., 1942. Covers the number of inhabitants of Puerto Rico. Prepared under the supervision of Dr. Leon E. Truesdell, Chief Statistician for Population, U. S. Census Bureau.

Population (Bulletin No. 2), U. S. Department of Commerce. 82 pp.; U. S. Government Printing Office, Washington, D. C., 1943. Covers characteristics of Puerto Rico's population. Prepared under the supervision of Dr. Leon E. Truesdell, Chief Statistician for Population, U. S. Census Bureau.

Population (Bulletin No. 3), U. S. Department of Commerce. 106 pp.; U. S. Government Printing Office, Washington, D. C., 1943. Covers occupations and other characteristics of Puerto Rico's population, by age. Prepared under the supervision of Dr. Leon E. Truesdell, Chief Statistician for Population, U. S. Census Bureau.

Puerto Rico—Agriculture, Farm Property, Livestock, Crops, U. S. Department of Commerce. 84 pp.; U. S. Government Printing Office, Washington, D. C., 1942. Part of the 16th census. Prepared under the supervision of Zellmer E. Pettet, Chief Statistician for Agriculture, U. S. Census Bureau.

EDITOR'S NOTE.—The listing of publications here does not necessarily imply an endorsement of them by the Department. For copies of private publications, write direct to the publishing agency given in each case.

ALONG THE *Agricultural Front*

▲ Cuba Sends Smokes and Candy to U. S. Fighting Men

Cuban school children and war workers recently contributed 15 million cigarettes, 1 million fragrant Cuban cigars, 100,000 pounds of hard candies, 160,000 chocolate bars, and 10,000 phonograph records to Uncle Sam's fighting forces, according to a recent announcement by Dr. José Ramon Cuervo, President of the Havana Rotary Club, which sponsored the drive.

"Throughout the island," Dr. Cuervo says, "school children cheerfully went without lunch to contribute to the fund. Factory workers worked one day at reduced pay, donating the difference to the campaign. Sugarcane workers gave a portion of their modest earnings, all in the same cause.

"We all hope that these tokens of our admiration and friendship for our fighting friends to the north may have made life on the battlefront a little happier for the soldiers who are fighting our common battle for freedom."

▲ Chilean Farm May Produce Seeds for Post-War Europe

Near Santiago, Chile, a seed farm owned and operated by a French refugee is producing varieties of garden seeds, particularly beans, onions, and carrots, that are adapted to Western Europe, especially France and the Low Countries. The owner has expressed the hope that he may be able to produce substantial quantities of these garden seeds for shipment to various European countries after the war.

▲ Brazil Transports Poultry by Plane

Recently more than 35,000 chicks and young turkeys were flown from Rio de Janeiro to the states of Rio Grande do Norte, Parahyba, Pernambuco, and Algoas in the "bulge" area of Brazil, to help solve a war-time food supply problem that has arisen in that area.

▲ Strategic Materials From the Caribbean

The Caribbean Islands have become an important source of strategic war materials, according to a study entitled "The Caribbean Islands and the War," prepared by the United States section of the Anglo-American Caribbean Commission and published by the State Department. The Caribbean area, as defined in the study, includes, in addition to Puerto Rico and British, Netherland, and French possessions, the Latin-American Republics of Cuba, Haiti, and the Dominican Republic.

Normally, the chief exports of this area are sugar, cocoa, and bananas, but the study lists among the export possibilities of the Caribbean countries 34 materials essential to the war effort. Among the more important of these products are alcohol, castor beans, chromite, copper, glycerin, manganese, mahogany, rubber, sisal, nickel ore, petroleum products, luffa sponges, and leather. Also produced here, the study discloses, is some of the world's best long-staple cotton from which parachutes and barrage balloons are made.

▲ Corn for Tropics Being Developed

New types of corn adapted to production in the tropical Americas are being developed by the Inter-American Institute of Agricultural Sciences in Costa Rica. Some of the most promising types have been found among 79 varieties of Guatemalan corn made available to the Institute by Sr. General Roderico Anzueto, Guatemala's Secretary of Agriculture.

Dr. Earl N. Bressman, director of the Institute, says that some of the Guatemalan varieties quickly develop sturdy root systems, indicating unusual adaptability to tropical conditions. His opinion is that these Guatemalan varieties have excellent possibilities for inbreeding and for improvement to provide types especially adapted to tropical Americas outside Guatemala.

▲ Brazil Boosts Castor Oil Supply

People of the United States, other than children, will be glad to learn that the United States supply of castor oil has improved, thanks to imports of castor seed from Brazil. This strategic war product has for over a year been restricted to military and the more essential civilian uses but is now sufficiently plentiful to supply many peacetime needs, according to information released by the Office of the Coordinator of Inter-American Affairs.

Because of its quick-drying, water-resistant, and plasticizing qualities, castor oil is used in the production of coated fabrics, protective coatings for airplanes, insulation, food containers, guns, ships, and other war materials. The increased supplies from Brazil will permit the use of this oil to improve the quality of such products as shoes, raincoats, paints, varnishes, and printing inks. Its use in making soap increases lathering quality and solubility in water. Incidentally, the familiar medical use of castor oil consumes only a fractional part of the total supply.

Although the castor plant grows wild in many parts of Brazil, it is also cultivated. Total production for 1943 has been estimated at 250,000 tons, which represents a 55-percent increase over 1937, and from this increased production the United States is getting most of its supply.

Inter-American cooperation, coupled with improved shipping conditions, has helped to supply war-time needs for castor seed. A purchase agreement between Brazil and the United States stimulated production. The contract of purchase was negotiated by the Board of Economic Warfare in 1942, the Commodity Credit Corporation acting as the fiscal agent, and the former Office of Economic Warfare, now part of the Foreign Economic Administration, has made technical advice available to Brazil in development of the crop.

▲ Quebracho From Paraguay

More than 5½ million pounds of quebracho extract for tanning leather were shipped from Paraguay to the United States during the first 11 months of 1943, according to a report from Paraguay. Over 2,600,000 pounds of this total amount were shipped in November.

▲ Venezuela Displays Agricultural Progress

At its Agricultural and Livestock Exposition held during the week ending December 26, 1943, at Maracaibo, the State of Zulia, Venezuela, displayed achievements in stock raising, dairying, and agriculture in general. The exposition, an official report points out, is an attempt by the Government to increase interest in local products and to raise their standards.

Animals exhibited included 171 head of cattle, mostly the beef type, 37 horses, ponies, mules, and burros, 32 swine, 25 sheep and goats, and 63 head of poultry. The great variety of agricultural products on display included dried fish, honeycombs, bananas, pineapples, grapefruit, mangos, coffee, tobacco, corn, and sesame. For the best specimens exhibited a total of about $6,000 in cash prizes was awarded, in addition to various medals and other decorations.

▲ Brazil Effectuates New Hunting Code

A new hunting code has recently gone into effect in Brazil which, in addition to provisions on hunting in general, includes instructions for the exportation of wild animal hides and skins, live wild animals, birds, feathers, and butterflies.

According to an official report, the new code also sets up rules regarding the collection and exportation of scientific specimens, and the procedure for hunting by tourists, and clarifies the status of professional and amateur hunters. A Division of the Ministry of Agriculture has the responsibility of carrying out the provisions of the new hunting code.

▲ American Republics to Consider Post-War Problems

The Governing Board of the Pan American Union has proposed that the 21 American Republics meet in conference in Washington, D. C., in September 1944, or earlier, to consider post-war economic problems. If the proposal meets with the approval of the various governments, formal invitations will be issued.

The recommendation that such a conference be held was made by the Executive Committee on Post-War Problems, which committee is composed of the Ambassadors of Mexico, Ecuador, Brazil, Cuba, Uruguay, and Guatemala, and the Chargé d'Affairs of Colombia.

▲ Victory Garden Program Under Way in Peru

Peru has launched a Victory Garden program on a national scale to help overcome wartime food-supply problems. In this program, which was organized as an inter-American food-supply project, school children, college boys and girls, factory and office workers, municipal organizations of various kinds, and family groups are being urged to cultivate Victory Gardens.

▲ Honduran Fairs and Expositions in 1944

Each year several fairs or expositions are held in Honduras. The most important of these celebrations is the National Exposition and Fair of Comayaguela, D. C., which continues from December 7 to December 24 and is sponsored by the Council of the Central District, Tegucigalpa, D. C. The annual *Feria Patronal de San Pedro Sula* is held from June 24 to July 4, and *La Feria Porteña*, at Puerto Cortés, from August 10 to August 17.

Although some effort is made to display native products at these fairs, they are primarily carnivals and religious festivals.

▲ Panama Plans Program to Improve Living Standards

To obtain information concerning Panama's dietary habits, the National Institute of Nutrition plans to distribute special questionnaires among students attending elementary and advanced schools of the Republic. By this means it is hoped that food consumption in the various areas of the country will be determined, to serve as a basis for a study of and improvement in local diets.

Along with this food-consumption census the Institute plans a campaign to stimulate public interest in the agricultural development program which proposes better use of arable lands to produce food for domestic use.

▲ Mexico Expands Its Irrigation Program

Mexico plans to spend more than $16,000,000 this year to bring new land under cultivation by further extending its irrigation program. This fund is at the disposal of the National Irrigation Commission and will be used for work now under way that will irrigate 260,000 acres.

This is a part of Mexico's 6-year program, begun in 1941, to improve the irrigation of 653,000 acres and to open an additional 1,080,000 acres to cultivation. When the program is completed, the total irrigated area in Mexico will exceed 3,000,000 acres, and estimates are that it will benefit more than 1,000,000 people. The great La Angostura dam in Sonora, completed in 1940, not only makes possible the irrigation of 308,000 acres but also provides power for electricity in the Yaqui Valley.

▲ Long Staple Wool Produced in Uruguay

Señor A. L. Urtubey, a Uruguayan *estanciero*, claims to have developed a special breed of sheep that produces wool of unusually fine quality and length of fiber, some of it ranging around 5 inches in length. Señor Urtubey says this wool has brought a record price on the local market for the past 23 years, having been quoted at approximately 20 percent higher than that for the nearest competitor.

▲ Ecuador Plans Agricultural Improvements for 1944

Preferential attention will be given in 1944 to the creation of stations for analyzing and publicizing the agricultural systems of Ecuador, according to Carlos Roca Carbo, Ecuadoran Minister of Agriculture. These stations are to be set up in the Provinces of Bolívar, Esmeraldas, and Manabí, and in the city of Tulcán.

▲ Venezuelan Coffee Growers Organize

Coffee growers in Venezuela are organizing the *Federación de Venezuela*, largest group of coffee growers in the Republic, for the purpose of increasing and improving production and exportation of the product.

▲ Brazil Establishes a National Rural University

Under a decree-law which became effective January 1, 1944, Brazil's National School of Agronomy was converted into a National Center of Agricultural Education and Research. The new set-up will serve as a graduate school for students from all over Brazil and will bring under its administration and curricula all the country's agricultural schools and experiment stations.

This unifying of all phases of agricultural instruction is admittedly an innovation and is believed to be a progressive stride toward developing Brazil's agricultural resources. Plans are to exchange scholarships and publications and to invite outstanding professors of the other American Republics to give graduate courses.

DAIRY CATTLE OF COLOMBIA

(Continued from page 74)

recognized these problems and are making progress toward their solution.

There are 30 to 35 factories and distribution plants in the country. Pasteurizing plants are found in most of the larger cities. At present, however, only a small part of the milk that reaches the consumer goes through these plants. It is highly probable that as the milk-consuming public becomes aware of the merits of pasteurized milk and as soon as these plants become better established, they will command a greater part of the market and create additional outlets for milk and its products.

Cheddar-type cheese is made in a factory at Ubate, Colombia.

Progress toward development of additional factories and milk-pasteurizing plants in all parts of the country is temporarily held up because of the inability to obtain modern plant equipment, most of which has to be imported. The new Government-sponsored cooperative plant at Bogotá, however, known as the *Industrial Colombiano de Leche*, has its equipment and is about ready to start operating. This plant is equipped to pasteurize and market fluid milk and to manufacture butter, cheese, and dehydrated milk. It will modernize and greatly enlarge the fluid-milk market of Bogotá, which in turn should stimulate milk production by making a dependable and steady market for milk in that section.

A milk-drying plant has been proposed at Bugalagrande in the Cali Valley which will provide a more adequate market for the large volume of milk that can be produced in that area. With the establishment of similar plants in other favorable production areas, and the continuation of better breeding, feeding, and management practices, along with improved transportation facilities, there is high promise that Colombia will have a self-sufficient dairy industry.

PARAGUAY IMPROVES ITS AGRICULTURE

(Continued from page 65)

Quebracho extract is manufactured in four large plants. Also, logs of various types are exported in considerable quantity. In general, forest industries supplement agriculture in providing opportunities for employment of people in rural areas.

The recently inaugurated credit program should help many of Paraguay's farmers to produce more and better products. Other countries will no doubt follow with interest the development of this plan. If it succeeds in Paraquay, in all probability the idea may be tried in other countries as a means of aiding farmers with limited resources and low incomes to improve their farms and raise rural standards of living.

The forests of Paraguay help provide employment for many rural people. These hardwood logs are ready for shipment down the Paraná River.

AGRICULTURE IN THE AMERICAS STANLEY H. GAINES, EDITOR

A monthly publication of the Office of Foreign Agricultural Relations of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 10 cents per copy, or by subscription at the rate of 75 cents per year, domestic; $1.20 per year, foreign. Postage stamps will not be accepted in payment.

Gifts of the Americas

THE CASHEW

HALLY H. CONRAD

When the enticing fragrance of roasted nuts lures passers-by into a United States nutshop, the cashew is readily distinguished among the wares by its shrimplike shape and rich creamy color. Few think of its origin when nibbling "just one more," but it is another product, like cinchona and rubber, that traveled to the East before attaining its commercial zenith in the United States. Although best known when roasted and salted, the nut is also used in confections. It yields a valuable culinary oil, similar to olive oil, and its juice is applied in native countries to cuts and abrasions much as we use iodine.

The cashew tree, most authorities now agree, is a native of Brazil. It grows in all sections but is most abundant in the northwestern part of the country First discovered by the early Portuguese voyagers, it was carried by them to the West Indies, India, and Africa. At present, the cashew tree grows throughout tropical America but is cultivated more extensively in India than elsewhere for the production of nuts. The Brazilian Indians called the tree *acajú*, which the Portuguese took over as *cajú*, to become cashew in English, but in Spanish-speaking countries the tree is called the *marañon*, presumably from Maranhão, one of the Brazilian States in which it flourishes. The tree, according to botanists, is the *Anacardium occidentale*, L., a member of a large family that includes the mango, the pistachio, sumac, and even poison ivy! Its height is usually from 30 to 40 feet, and its spread may be as much as 60 feet.

As it is picked from the tree, the nut appears to be an inch or more in length, somewhat kidney-shaped, and grayish in color. The kernel is enclosed in two coverings. The outer is smooth and leathery; the inner is dark-colored and contains an acid which, if the nut is bitten, causes the lips and tongue to become sore and inflamed. Native children are not always deterred and suffer the consequences just as youngsters in this country dare to eat persimmons or green apples despite subsequent discomfort. After they have been subjected to heat, the nuts can be cracked with impunity, but kernels for the trade require careful preparation. They are incased in a dark skin, something like that of an almond, which is difficult to remove without excessive breakage. In India they are graded as (1) large and unbroken, (2) small and unbroken, and (3) broken pieces. These, after being "sweated" in ovens to prevent cracking, supply most of the United States demand for salting and for confections.

The natives of tropical countries do not always value the cashew tree so highly for its nuts as for other contributions to their welfare. In Guatemala and Brazil, particularly, the cashew apple is more prized. This is the pear-shaped swelling of the stalk to which the nut, the real fruit, is appended. This enlargement has firm white flesh, a pleasant acid taste, and is said to possess medicinal properties, especially beneficial to those afflicted with scurvy.

Cashew leaves, when broken into bits, serve as a dentifrice that is claimed to preserve teeth to a ripe old age. For fuel the tree offers shells of the nuts and wood for charcoal—the poor man's source of heat and warmth in many lands. Oil from the nutshells makes a powerful insect repellent, a preservative for fish nets, and a lubricant for cart wheels. The bark of the tree, sometimes employed for tanning purposes, exudes a gummy substance that is substituted for gum arabic and is used in mucilage and varnishes. The sap or juice obtained from an incision in the tree turns dark upon exposure to air, providing an indelible ink, and native workmen utilize it as a flux for soldering metals. Finally, the tree offers valuable timber for furniture, packing cases, and boats.

Perhaps the poet did not have the cashew in mind when he said "only God can make a tree," but it is certainly a godsend to the poorer natives of tropical countries. One writer declares, however, that the cashew is truly appreciated only in Brazil, its native land, where it furnishes "food and household remedies to the poor, a refreshing beverage to the sick, a sweetmeat for tables richly served, and resin and good timber for industrial uses." Since that statement was made Brazil has also awakened to the value of the nuts, for shipments are now coming from that country to the United States.

NICARAGUA

Nicaragua, the largest of the Central American Republics, is a wedge-shaped country about the size of Alabama. Honduras is on the north of it and Costa Rica is on the south. Two mountain ranges cross the country from southeast to northwest to join the highlands of Honduras. Between the two ranges are extensive plains and Nicaragua's two fresh-water lakes—Managua (or Xolotlán, the original Indian name) and Nicaragua (or Cocibolca)—connected by a 15-mile river. Most of the rivers on the Pacific side of the mountains drain into these two lakes, and Lake Nicaragua's outlet is to the Atlantic Ocean, through the San Juan River, which forms part of the boundary between Nicaragua and Costa Rica.

The Climate

As in most tropical countries, the climate varies with altitude. The Pacific coast region is hot, with a mean temperature of 78° F. and rainfall varying between 40 to 80 inches a year. The rainy season is from May to November. The Caribbean shore is hot and swampy, the rainfall averaging 150 inches a year and occurring nearly the year round.

The People

More than half of Nicaragua's 1,400,000 people live west of the principal mountain range. Managua, the capital, is located on the southern shore of Lake Managua and, with almost 120,000 people, is the largest city. The sparse population of the eastern or Mosquito Coast is composed largely of Negroes, pure-blood Indians, and a few Chinese merchants.

Mineral and Forest Resources

Since the days of Spanish conquest, Nicaragua has been a significant source of gold, although only in the past 10 years have gold exports constituted a sizable portion of total exports. Gold, silver, and salt are the only minerals exploited, although copper, lead, zinc, tin, nickel, mercury, iron, sulfur, and precious stones exist in the country.

Forest resources are extensive, particularly in eastern Nicaragua. Pine is exported from the northeast, and mahogany and small quantities of ebony, cedar, lignum vitae, and quebracho from the southeast. Other forest products include balsam of Peru, copaiba, cinchona, ipecacuanha, vanilla, sarsaparilla, and rubber. Recently rubber exports have increased under stimulus of wartime demand. The number of rubber workers in December of 1943, for example, was 7,000 compared with 300 eighteen months earlier.

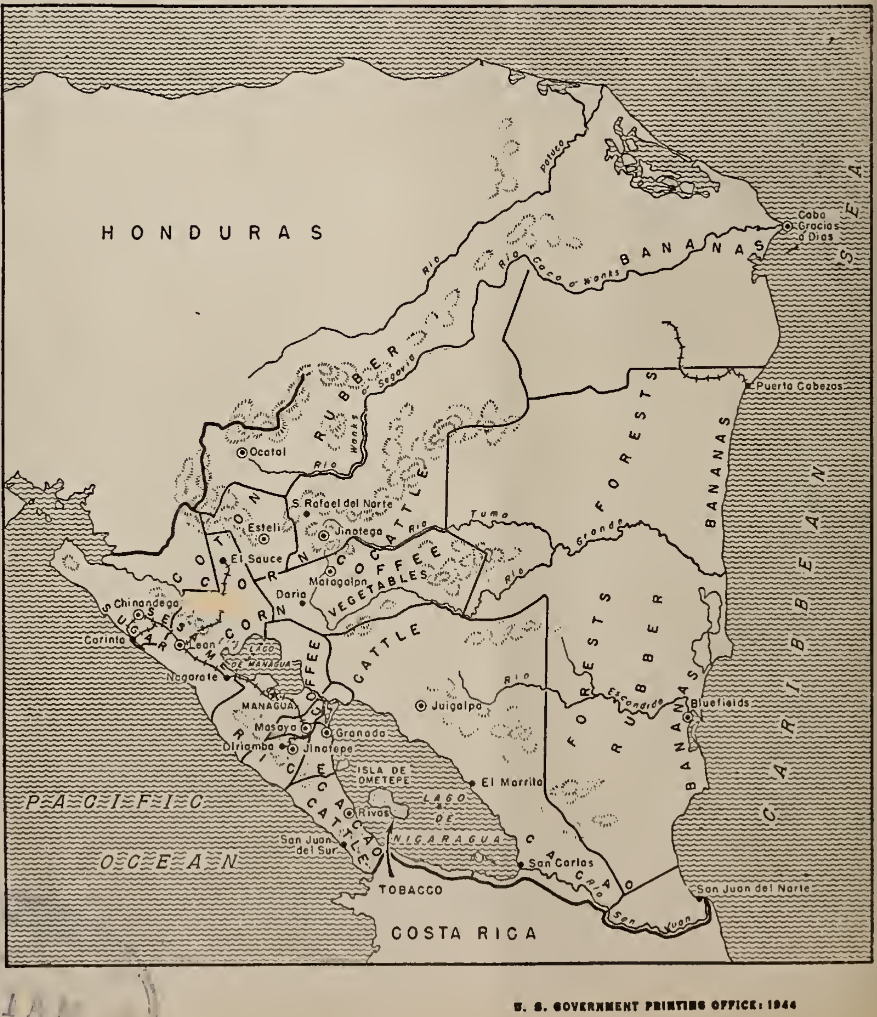
Agriculture

Although mining, particularly gold mining, is becoming increasingly important in Nicaragua, the country still depends primarily on agriculture. Coffee is the principal crop and has been the highest valued export. Small amounts of cotton, sugar, and cacao are also exported. Sometimes corn is exported to neighboring countries. Staple food crops are beans, corn, and rice, all usually grown in sufficient quantity for domestic use. Shortages of food products are largely in the processed or semiprocessed varieties, the principal one being wheat flour.

With the exception of bananas, which are cultivated on the east coast, most agricultural products are grown west of the principal mountain range, where the population is concentrated.

The livestock industry is important, and sizable numbers of cattle are exported. In 1940 the cattle were estimated at 700,000 head; pigs 250,000; horses 150,000; sheep 15,000; and goats 5,000.

A cooperative agricultural experiment station was established at El Recreo jointly by Nicaragua and the United States under an agreement of July 15, 1942. The station will be concerned primarily with the production of complementary crops for export—rotenone-bearing plants, cinchona, and rubber—although it will encourage farmers to meet their own food needs from local production. In addition to the new cooperative station, Nicaragua has a national school of agriculture at Chinandega and a central experiment station at Masatepe, both designed to improve the country's agriculture.



APR 11

U. S. GOVERNMENT PRINTING OFFICE: 1944

CURRENT SERIAL RECORD
MAY 11 1944

Agriculture IN THE Americas

Issued Monthly by the OFFICE OF FOREIGN AGRICULTURAL RELATIONS
UNITED STATES DEPARTMENT OF AGRICULTURE

IN THIS ISSUE

	PAGE
Lagunas—Barbasco Capital of the World	83
Can We Have the Right Food?	87
Collaborators in Soil Conservation	91
Potato Improvement in Peru	94
Along the Agricultural Front	97
Gifts of the Americas—The Guava	99

May 1944

NAMES & NEWS

Agricultural Survey

Gonzalo S. Garrido of the technical and administrative staff of the Ministry of Agriculture of Mexico spent some time recently in Puerto Rico in the course of an agricultural survey which began in Trinidad in 1942 and is to include Venezuela, Colombia, Ecuador, and Peru. The main purpose of the survey is to determine how agricultural organizations in these countries can benefit Mexico's own agricultural program. In Trinidad Dr. Garrido became interested in cocoa culture, and in Puerto Rico his attention was drawn to vanilla.

For the past 10 months Dr. Garrido has been interested in coordination in Puerto Rico between Federal and Insular agricultural agencies, including the experiment stations, cooperative extension work, and the recently organized Institute of Tropical Agriculture.

Dr. Peter Henry Rolfs, who in 1921 was assigned by the U. S. Department of State to establish an agricultural college for the State of Minas Gerais, Brazil, died at Gainesville, Fla., on February 23 in his seventy-ninth year. After establishing the college in the State of Minas Gerais, Dr. Rolfs directed it until 1929, when he accepted a position as technical agricultural consultant for the same State. He returned to Gainesville in 1941 and since then has been of much assistance to Brazilians visiting or studying in the United States. Dr. Rolfs was one of the early workers on citrus and other tropical plant diseases. Among his published works are *Vegetable Growing in the South for Northern Markets* (1896), and *Subtropical Vegetable Growing* (1915).

Agriculturists from Brazil

Mario Dias Teixeira, Julio Nascimento, and *Raimundo Silveira,* all of Brazil, are in the United States as guests of CI–AA's Food Supply Division to study various phases of agriculture.

Dr. Teixeira, a veterinarian, is on a dairy farm in New Jersey where he is studying dairying and livestock management with emphasis on artificial insemination. Senhor Nascimento, an agronomist, will spend most of his time studying the use and repair of farm machinery on a large county-owned farm in Shelby County, Tenn. Senhor Silveira, also an agronomist, is studying farming and general agricultural conditions in Nebraska with emphasis on poultry.

Soil Conservationist from Mexico

Lorenzo R. Patiño, Chief, Department of Soil Conservation of Mexico's National Commission of Agriculture, arrived here from Mexico City on March 23. He will be in the United States for 3 months as a guest of the U. S. Department of State and during this time Mr. Patiño will study the work of the USDA's Soil Conservation Service. His itinerary includes a trip through the Southeastern, Southern, and Southwestern States to study all phases of soil conservation work being done in those areas.

Mr. Patiño has begun an active soil conservation program in his country in the States of México, Tlaxcala, Morelos, and Jalisco, where Mexico's erosion problem is particularly acute.

On May 12, 1551—393 years ago—in Lima, Peru, the University of San Marcos was founded by a royal decree of Philip II of Spain. This is the oldest university of the Western Hemisphere. An account of the summer school held there is given in the April 1942 issue of *Agriculture in the Americas.*

Agriculture IN THE *Americas*

Vol. IV • MAY 1944 • *No. 5*

Lagunas—Barbasco Capital of the World

The barbasco plant is an important source of rotenone insecticide, and insecticides are vital to the production of food for the Allied Nations. This article tells how the farmers of Lagunas, Peru, are contributing importantly to the insecticide supply.

by **E. C. HIGBEE**

Ten years ago few people, if any, would have predicted that the little Peruvian Amazon Valley village of Lagunas could become a world capital of any kind. Yet today it has the notable distinction of being the foremost production center of the insecticide rotenone, one of the principal strategic products derived from tropical plants.

As a matter of fact rotenone itself was just becoming a volume article in world trade 10 years ago. At that time the unsuspecting people of Lagunas knew only that they raised a plant called "barbasco" together with food crops on their little farms or *chacras*. While they could not eat barbasco, botanically classified as *Lonchocarpus utilis*, the roots of the plant did help indirectly to augment their daily menu. Periodically they would dig some of these roots, mash them, and use them for their *pescas* or fish-poisoning expeditions on the small creeks within a short canoe ride of Lagunas.

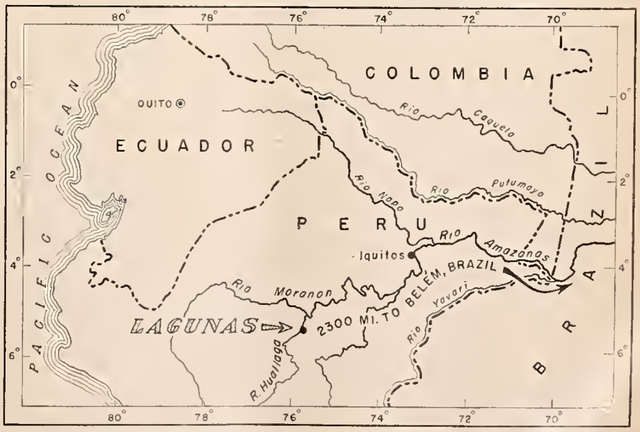
Although they knew nothing of the chemical properties of rotenone and its virtues as a killer of the cattle tick, the pea aphid, the flea, fly, mosquito, and dozens of other destructive and annoying pests, the Lagunas natives did know that the juice of the barbasco root would kill fish. More important for these people who hunt and fish because they must, to live, the poisoned fish which flopped to the surface of the water were perfectly edible. They had read no scientific reports but in their own way they knew, as many generations of Indians and Amazon settlers before them had known, that this particular barbasco was nonpoisonous to human beings.

While "barbasco" is a term commonly applied throughout tropical America to a great variety of fish-poison plants, its usage in Amazonian Peru has lately come to signify *Lonchocarpus utilis* exclusively. Even a plant so closely related as *L. urucu*, also a rotenone producer, although usually of inferior quality, is now designated as *sacha*, or false, barbasco.

In 1910 a Peruvian chemist named Gerardo Klinge discovered that ground lonchocarpus root would kill the cattle tick. The commercial significance of his discovery, however, was overlooked for many years. Not until the early 1930's did the river dwellers of Amazonian Peru in general and of Lagunas in particular realize a world market was ready to send boats to the mud banks in front of their villages to buy all the barbasco roots they could grow.

Location and People

Lagunas is situated on the Huallaga River near its



The 2,500 people of Lagunas live near the banks of the Huallaga River, which is a tributary of the mighty Amazon.

The author spent approximately 6 months of 1943 in Iquitos and Lagunas, Peru, in the interests of improving the quality and increasing the volume of insecticides, particularly barbasco. Mr. Higbee is on the staff of the Office of Foreign Agricultural Relations. Another article by him, "Agriculture Across the Andes," appeared in the January issue of AGRICULTURE IN THE AMERICAS.

confluence with the Marañon, which is another tributary of that great network of navigable waterways collectively known as the Amazon system. As a matter of fact, Lagunas is two villages: *Viejo* and *Nuevo*—old and new. Together they have a population of about 2,500.

At one time Lagunas Viejo constituted the village. In its modest heyday it was located near the bank of the Huallaga River. While the village itself did not move, what was of equal importance to a people who are as dependent on the dugout canoe for transportation as some North Americans are on rationed tires, the Huallaga moved. Where the current once flowed, acres of sandbars developed. Eventually the sandbars became overgrown with jungle. When it became necessary for some of the people to rebuild their houses of palm bark and palm leaves, they erected them half a mile away near the new riverbank, now the site of Lagunas Nuevo. Isolation by the gradual development of sandbars or even destruction by bank erosion, according to the whims of the rapid meandering river currents, is a fate commonly experienced by Amazon villagers. The process usually extends over a period of many years.

Few regions of the world are as economically primitive as the Amazon. Yet it is by no means the vast unexplored hide-out of savage head hunters so exciting to readers of adventure fiction. Woodburning double-decked steamers ply practically all its navigable waterways, and sharp-witted traders from every corner of the globe have managed to scrape together small businesses in nearly all the inhabited areas. Except in the larger cities, however, the machine age is long overdue.

Lagunas knows nothing, for instance, of electric lighting, piped water, or a doctor. But even more remarkable is the fact that not a single plow or draft animal is to be found in this agricultural community which produces such an important share of the United Nations' supply of rotenone. All the labor of clearing virgin and second-growth jungle, and of planting, cultivating, and harvesting barbasco is done by hand. The only common tools are the machete and ax.

Land Preparation, Planting, and Harvest

If the farmers of Lagunas had been asked to wish for an export crop they could profitably raise with such rudimentary equipment, they could not have specified a more suitable one than barbasco. Military operations in the Pacific Islands have familiarized North Americans with the character of the tropical jungle. On such jungle land, cleared of its enormous trees and hanging vines, barbasco is planted at Lagunas. The crop will not grow on the wet grassy swamplands or on the frequently flooded riverbanks. The trees are felled with ax and machete and left to dry in the sun until their leaves and smaller branches will burn. On still clear days the brush is set afire, leaving seemingly devastated fields of charred logs tumbled one over another. Yet such a scene of desolation characterizes the typical "well-prepared" seedbed for the hardy aggressive barbasco plant.

This, believe it or not, is a well-prepared seedbed for the hardy barbasco plant.

Scarcely has the ground been permitted to cool before Lagunas planters begin to put in their crop. Theirs, too, is the struggle common to farmers and Victory Gardeners alike—they must get their crop started ahead of the weeds. As "seed" they use pieces of stem, *estacas*, which are cut from recently harvested plants. These *estacas* are about the length and sturdiness of stool legs. Two- or three-year old mature plants look like bushy trees and average about 8 feet in height.

Under cultivation *L. utilis* (barbasco) grows erect. Its harvest presents none of the problems which make the ground-trailing derris, another rotenone-yielding plant native to the Far East, so tedious and costly to harvest at times. In the forest wild derris and barbasco grow very much alike. Their trunks become twisted, ropelike stems—tree-climbing vines of the best "Tarzan" variety.

Lagunas farmers proceed with their harvest by cutting the top of the barbasco plant off about 1½ feet above the ground. Beneath the stump they shove a sharply pointed hardwood pole to pry the roots to the surface. The greater part of the spreading superficial root system they pull from the ground in one bunch, using the 1½-foot stump as a handle. The remaining roots they pull one at a time, occasionally loosening the soil with a machete to make the task easier. To get a better grip on the long slippery single roots they often pad their hands with leaves stripped from the hacked-off plant.

The green roots from each plant average about 2 pounds in weight. As they are dug they are doubled up in loops and tied with jungle vine into bundles called "*fardos*" averaging 80 to 100 pounds apiece.

The present boom in the rotenone market, caused by limited available supplies and Japanese occupation of the Far Eastern derris-producing areas, has led Lagunas farmers to increase slowly but steadily the acreage devoted to this crop. The extent of increase is limited, however, because every tillage operation is done by hand and all loads are still carried by the natives on their backs or heads. If ever in the future Lagunas loses first place as the barbasco capital of the world, it will be because people elsewhere will have realized how much more economically rotenone can be produced by using modern cultural methods and machinery.

Before harvesting a mature stand of barbasco, Lagunas farmers have made it a practice in recent years to cut and burn over an extra patch of jungle or second growth *purma* as large as the area harvested. As the harvest progresses, women and children assist in cutting up the stems of the chopped-down plants so the original field and the new clearing can both be planted. The planting operation as carried out at Lagunas consists of driving a "mole hole" just under the surface of the ground with a long pointed pole. The *estacas* are slipped into the hole, leaving only the tip bud exposed. The earth is then firmed around the *estaca* by stepping down with bare feet on the mounded earth of the "mole" ridge.

The white ropelike roots in the foreground are a part of the barbasco root system; in the background are the mature plants.

Obviously a single farmer even with the occasional help of his family cannot clear land and care for more than 5 or 6 acres of such a crop in addition to producing food, hunting, and fishing. To produce a hectare (about 2½ acres) of 2- to 3-year-old barbasco on virgin land, which will normally yield about 10,000 pounds of green root (equivalent to approximately 5,000 pounds, 10 percent moisture) requires an average of 300 man-days of labor. This figure can be broken down to rough averages of 115 days for clearing and burning virgin forest, 20 days for cutting *estacas* and planting, 85 days for cutting weeds, and 80 days for harvesting.

One would suspect that less time and expense would be involved in growing a crop on land which has just been harvested than on forest land which must be cleared. But Lagunas farmers and other barbasco raisers on the Amazon who have no machine cultivators find there is actually less work involved in felling a forest than in keeping down the extra amount of weeds, particularly grasses, which take over on old land that has been in cultivation. Many North American farmers can visualize the labor involved in weeding such land if they were to imagine themselves cultivating a corn crop with an oversized corn knife.

Costs of Production

The average cost of producing barbasco on newly cleared jungle land at Lagunas in the summer of 1943 was 1,000 soles per hectare or roughly $60 an acre. This figure includes all labor charges at 3 soles or 45 cents a day, which is what the farmer would earn if he hired out, as many do, particularly to assist neighbors with harvesting. On *purma*, which is second-growth jungle or weed-infested cropland, the costs were about 1,200 soles per hectare or nearly $75 an acre. The initial expense of preparing the land for planting was lower but the heavier cost of weeding increased total costs.

It is now necessary to use *purma* at Lagunas because large pieces of well-drained virgin forest land are available only after a 2-hour walk from the village. As yet, few farm families have been able to break away from the age-old tradition of community life to build their homes and settle down on their *chacras* (small farms) to avoid these long daily walks.

Lagunas farmers depart from the village in the morning, sometimes accompanied by their wives and children, to work in the fields. Very few of them actually own their land, since most of the area within 2 kilometers (1.2 miles) of the village belongs to the community; the land for some distance beyond belongs to the central government. It is allotted in parcels for a tax on the produce to individual families according to their ability to clear and keep it in cultivation. Since Lagunas is a public village and not the property of a patron, the people are free to spend their full time at work on their own *chacras*. There are no roads leading into the country but there is a maddening network of *trochas* or paths leading over logs, swamp holes, creeks, and gullies, which only the Lagunas farmers, many of whom are Indians, can negotiate without confusion.

Production Methods a Limiting Factor

Life of the Lagunas barbasco planters is no harder than that of farmers the world over but its compensations, by any standard, are few. The amount of produce a family can raise for market with machete and ax will always be limited, indeed, regardless of world demands for the product. The village has none of the aspects of a boom town. Only two of its buildings are of brick. One of these, the most recently constructed, is the home of Señor Juan Vasquez, who is known in eastern Peru, or the Peruvian Oriente, as the "Ace of Barbasco." It was he and his family who first dared to risk years of labor on barbasco as a commercial crop at Lagunas. He was successful beyond his most extravagant hopes. With the proceeds of his first harvests he grubstaked others so they, too, could plant. Today he has part interest in almost 1,000 acres of barbasco which have been established in little patches by neighbors he has helped finance. Vasquez's achievement is already legendary in the Peruvian Oriente, for everyone knows he began with nothing but his machete 10 years ago.

Food Crops of Vital Importance

More important to the people of Lagunas than barbasco itself are their food crops, which consist primarily of yuca (manihot), bananas, and pineapples. Yuca, also known as cassava, is their staff of life. It means as much as corn in Mexico and more than bread to the people of the United States. Its starchy tuberous root is boiled like potatoes. Occasionally it is fried. More frequently it is grated, squeezed dry, and lightly toasted in pans over log fires to make the hard, gritty, almost tasteless but preservable staple known as *farina*. A fermented cassava liquor, *masata*, is the common home-made intoxicant.

No doubt one reason barbasco has become the most important export product of the Peruvian Amazon region in recent years, pushing ahead of such gum-producing plants as *balata*, *leche caspi*, and rubber by wide margins, is that it may be interplanted with the principal food crops. While many farmers have their favorite patterns and spacing distances for planting barbasco, the average allowance per plant is about 20 square feet, which allows about 2,000 plants to the acre. This wide spacing permits the full development of the mature 2- to 3-year-old plants. During its first year of growth, at least half the land can be devoted to food crops, and this dual production system is a fine combination for the small independent subsistence farmer. This type of farmer is today producing most of our rotenone supplies.

An aerial view of barbasco fields at Lagunas, Peru.

Lagunas barbasco planters are hunters and fishermen as well as farmers. Some of them have always preferred poison arrows and blowgun to the shotgun. With shotguns and ammunition now difficult to obtain, the blowgun is all many of them depend upon for their meat supply. Common game consists of a great variety of animals and birds, including wild hogs, deer, *ronsocos*, agoutis, *sachavacas* or tapirs, and monkeys. The skins of the wild hogs, deer, and *tigrillos* have commercial value. One can rarely walk through the mud streets of the Lagunas villages without seeing the stretched hides of these animals drying in the sun. Monkeys, *tucans*, baby tapirs, and, of course, parrots, paraquets, dogs, and cats are favorite household pets.

In spite of their awkward lengths of 6 to 10 feet, blowguns are efficient instruments because of their silent operation. With a shotgun a hunter must kill with the first shot or frighten his game. With the blowgun he may have another chance. If there are two or three birds or monkeys in a tree the chances are he may pick off all of them without sounding an alarm. The Lagunas farmers obtain their blowguns from Indians of the upper Marañon and their arrow poison is usually brought from the curare makers of the Napo River region.

The barbasco planters of Lagunas dispose of their rotenone roots in many ways. Sometimes, directly after planting, they sell their interest in the crop to someone with more available capital, retaining title to their interplanted cassava or bananas, which they must keep for sustenance. Some sell out when the crop is a year old; others when it is just ready to harvest. Sometimes the

(Continued on page 95)

Can We Have the Right Food?

Much is now known about improved food-production methods. Likewise, much has been learned in recent decades about efficient food use or nutrition. What must yet be done to link production and nutrition more closely together is discussed in this article.

by LOUISE STANLEY

Primitive man spent much of his time wresting from nature the food needed to satisfy hunger. Through centuries of experience he learned to control and direct nature in the production of this food. Out of these experiences have been developed the agricultural sciences. Now, through systematic research, production may be increased and the quality of foods changed almost at will.

Upon the right kind and amount of food directly depends the quality of human health. Thus, if the Americas are to be well fed, nutrition, as well as production methods, must be considered in formulating improvement programs. There is more truth than fiction in the saying that "You are what you eat," and agricultural planning that aims only at optimum production without consideration of optimum use will fall short of the potential and desirable goal.

Only recently have food experiences been organized into a science. While nutrition has evolved from the early habits and traditions in the use of food, and through experience costly in human life and health, only during this century has a real science of nutrition emerged. The most rapid strides in the development of this new science have been made during the last two decades.

Progress made in agricultural science makes it possible to increase and redirect production so as to produce the needed foods, provided, of course, farmers everywhere have an opportunity to put the desired practices into effect. But in our complicated economy no satisfactory plan has yet been developed for producing and distributing the foods required for good nutrition. If all groups of any population are to be well fed, food plans must be made in terms of human needs, and incomes must be maintained at levels that will enable consumers to buy that food.

Ministry of Agriculture, Guatemala

A great variety of fruits and vegetables can be grown, as evidenced by this display of farm produce at a fair in Guatemala City.

This failure to get adequate diets to large groups of people, while surplus stocks of food were built up for lack of markets, has brought into focus the interrelation of the different sections of present-day economy and the necessity of planning for consumption as well as production of needed supplies, not only within countries, but on an ever-widening scope. The war has further complicated the food supply situation. Its interference with shipping cut off usual markets, with serious economic results to areas of surplus production, and cut off necessary supplies to areas dependent upon food imports. It also brought about shifts in agricultural production to meet special war requirements.

War Emphasizes Deficient Diets

Too many men who have been called for service in the armed forces have, upon examination, been found unfit because of defects that could have been prevented by good diets. Men and women in war jobs must be physically fit, and physical fitness depends on the right food. The populations behind the lines, as well as the armed forces and industrial and agricultural workers, must be fed—and fed adequately—if morale is to be maintained.

The matter of food was considered of such importance a year ago that representatives of 44 nations, including those of 20 American Republics, met at Hot Springs, Va., to discuss nutrition and how the vast agricultural resources of the world might be directed after the war, to improve food supplies in every country. It was felt that, in the same way that united effort was necessary to win the war, only united effort could solve this age-old problem of freeing the world from hunger and malnutrition.

Reports resulting from this Conference pointed out that the diets of groups of populations in all countries, even those with most abundant food supplies, were not adequate. Inadequate diets were most prevalent in low-income groups, the reports showed. But at all income levels some diets did not provide the right foods in the amounts necessary to build abundant health. In some cases sufficient food was not available; in others there was a lack of appreciation of the importance of food to health, or a lack of knowledge of what constitutes a good diet.

These reports also showed that the results of inadequate diets are reflected in high death rates, especially among infants and young children, low life expectancy for the total population, a high incidence of tuberculosis that flourishes in malnourished populations, and in the prevalence of such diseases as rickets and osteomalacia, anaemias, beriberi, and pellagra. Even more widespread are work- and morale-deficiency conditions that result from poor diets. There was general agreement that better physical and mental health is possible for whole populations provided they get the food which nutritionists now know is required.

C. I. A. A. Photo

This nursery school at Belterra, Brazil, offers an opportunity for an early start in good food habits.

Planned Production Essential

Since food supplies of any area tend to be built around the foods produced there, the production of these supplies should be planned, as much as possible, to supply the foods required for an adequate diet. With improved methods of preservation, storage, and transportation, however, countries or areas are not necessarily dependent nowadays upon what they themselves can grow. So each country should grow those staple food crops that can be produced most economically, can be stored and shipped readily, and for which there are ready markets.

On the other hand, if adequate diets are to be available, each country, and even areas within countries, must concern themselves with the production of the perishable foods that are rich in vitamins and minerals and can be satisfactorily grown locally. Such foods are not only expensive to store and ship, but often lose valuable vitamins in the process. For these reasons countries and areas should make every effort to provide their own supplies of milk and milk products, fruits and vegetables, meats, poultry, fish, and eggs—all of which are rich in vitamins but tend to be lacking in inadequate diets.

If agricultural production, then, is to fulfill its purpose of supplying a fair income to farmers and if consumers at the same time are to get the needed food, there must be certain economic adjustments within

---

Prior to her appointment in February 1943 as special assistant to the Research Administrator of the U. S. Department of Agriculture, Dr. Stanley was Chief of the USDA's Bureau of Home Economics. She organized this Bureau in 1923 and guided its operations until her present assignment, where it is her responsibility to advise on food research problems relating to other countries.

nations and joint arrangements between nations to assure purchasing power to consumers and markets to producers.

On the basis of these premises, the Conference recommended that the governments represented should accept the responsibility of providing an adequate food supply for their populations as part of public policy, that agriculture within these countries should make such shifts in patterns of production as are necessary to work progressively toward providing this food. Further, the recommendation was made that these governments should work toward an expansion of industry to provide purchasing power to consumers to enable them to buy the foods they need. In the meantime Government should adopt necessary social measures to fill gaps in the purchasing power of groups that cannot afford required foods. All governments should take special steps to safeguard needed food supplies for those having special requirements—children, adolescents, and pregnant and nursing women.

Inter-country Exchange of Foods Desirable

Since few countries can produce economically all the foods required for a balanced supply, international arrangements will be necessary to facilitate the flow of commodities between countries. Many countries, in an attempt to achieve self-sufficiency in food production, obtain food at a sacrifice of land resources, agricultural income, and the diets of the populations concerned. The Conference suggested that any future international organization should give consideration to building stockpiles of stable commodities during years of plenty to serve the double function of absorbing price-depressing food surpluses and providing supplies for years of lean production.

The governments represented at the Hot Springs Conference received reports from their delegations, and each appointed a representative to the Interim Commission on Food and Agriculture. The Interim Commission has been drawing up plans, which by now have been submitted to governments, for a permanent United Nations organization on food and agriculture. If the plans are approved, the permanent organization may well come into existence this year. So it is important to look at the problem of agricultural planning within and among the American Republics in its relation to better nutrition. We must not only feed ourselves better and help improve the nutrition of the people of the other Americas, but also be ready to contribute to better feeding of the world.

In view of the need for speeding the production of certain strategic crops, supplies of which were cut off by war in the Pacific, legislation was passed by the Congress of the United States in July 1941 which provided funds for increasing production, through cooperative arrangements with certain other American Republics, of complementary crops important to the war effort. Similar legislation has been passed by the other governments. While most of these arrangements have had to do with non-food crops, special efforts are being made to provide adequate food supplies for the families of workers in the areas of intensive production. The experiment stations established to study problems in the production of complementary crops are also giving attention to the food crops necessary for local consumption.

The Inter-American Institute of Agricultural Sciences has as its aim the fostering of hemispheric cooperation in agricultural development. At the dedication of the new Institute in Costa Rica, in March 1943, Vice President Wallace pointed out its importance as a place where the youth of the two continents could pool their ideas and interests in working out the problems of commercial production of non-food strategic requirements. But he added, "Far more important than these investigations of commercial agricultural products * * * will be the studies of progress in the conditions of rural living. Important among these will be the studies of local food supplies." This gives us hope that research in human nutrition will be provided for at this Inter-American Institute.

Diet and Low Income Are Common Problems

The machinery for planning and for practical advancement of agriculture has been built and stands ready to be used in a joint effort between nutrition and agriculture. It remains for nutrition authorities to work out similar collaborative machinery that can work jointly upon the changes needed in the food supplies of the Americas to improve the health of all the varied groups in these republics—and they are varied. Representatives of the American Republics at the Hot Springs Conference pointed this out. Nutrition is a problem in sections of all these

U. S. D. A. Photograph by Knell

As in the United States, many of the other American Republics have already started school-lunch programs. This meal consists of an egg, cheese, black-eye peas, creamed potatoes, hot biscuits, a tangerine, and milk.

republics, more serious and widespread in some than in others. Low-income groups are a problem in these countries as elsewhere in the world. Planning food supplies is especially difficult in countries of mixed racial cultures and differing food habits, with groups living at widely different income levels and having different opportunities for education and production of their own food supplies. Isolated groups, because of their dependence upon local supplies, present special problems in some countries.

Dietary studies have been made in at least eight American countries. A summary of these was reported by Robert Morse Woodbury at the Eleventh Pan-American Sanitary Conference in Rio de Janeiro in September 1942. In the conclusion of his report he states that there are—

> * * * wide differences in nutrition levels in different sections of the population and at different income levels; comparatively few families even in relatively prosperous food-producing countries such as Canada and the United States have diets that are adequate in all respects, and a large proportion have diets which in respect of one or more food essentials are below the safe daily allowances.
>
> Disregarding * * * minor deficiencies or minor differences between countries and groups, the major deficiencies are sufficiently striking to point the need for remedial action and to emphasize the importance of national nutrition policies to raise the levels of nutrition.
>
> These studies, furthermore, point the way toward means of improving the dietaries.
>
> * * * the specific recommendations for the improvement of diets will include the addition of or an increase in the consumption of milk, milk products and eggs, the fresh green, leafy, and yellow vegetables, tomatoes, citrus fruits and fresh fruits, meats, and fish, the substitution of brown for white bread.

With such varying food habits in different parts of this hemisphere, even in sections of the same country, there will be corresponding variations in the commodity goals. Therefore, standards should be established against which the adequacy of goals in terms of diet needs can be measured.

Nutrition science has shown that food combinations on which populations have survived must provide some three dozen chemical substances, "essential" in varying degree for life, normal reproduction, the successful rearing of the young, and the maintenance of adult strength and vitality. Many of these so-called nutrients have been identified and desirable allowances of some of them in the diet have been established.

Food and Nutrition Policies Agreed Upon

In view of the need for a yardstick against which diets and food supplies can be measured, the Food and Nutrition Board of the National Research Council compiled the best available evidence as to amounts required for a good diet of 10 important nutrients—calories, protein, calcium, iron, vitamin A, thiamine, riboflavin, niacin, ascorbic acid, and vitamin D. Since the requirements for these vary with age and activity, tables were prepared showing the recommended amounts for different age groups and for adults at different levels of physical activity. These "suggested allowances" had been accepted as desirable goals by the United States, Great Britain, and Canada, and were accepted at the Hot Springs Conference as the ultimate goal toward which governments should aim their food and nutrition policies. The fact was recognized, of course, that immediate goals must necessarily be determined on the basis of practical possibilities, but that the final goal should always be kept in mind.

To translate these requirements into foods, or to allow the calculation of the nutrients available in food supplies and diets, food composition tables are available which readily give the amounts of these nutrients present in common foods.

Food habits are strong and frequently have a physiological as well as psychological base. Therefore, planning food supplies for individuals, families, or countries should start with an analysis of the foods customarily used and the amounts of each. Dietitians can determine what these factors contribute to the diet in terms of nutrients. Then, knowing the number, age, and sex of the members of the group to be fed, the nutrient requirements can be determined. Next comes the job of adjusting the amounts for certain groups or suggesting shifts to new foods that will supply more adequately the missing nutrients.

C. I. A. A. Photo

Victory gardens flourish in Brazil.

Studies show that low-income families in all areas and families in regions of low production are of necessity buying energy producing foods in the cheapest available form to satisfy hunger. Except in the Tropics, where large amounts of the starch-containing roots and tubers and fruits are used, cereals supply a large proportion of the food calories, or energy, in the diets of the world. Because cereals can be grown in some form in most areas and are

(Continued on page 93)

Collaborators in Soil Conservation

Nearly all the trainees from Latin America who worked with the USDA's Soil Conservation Service during the past 2 years have returned to their respective countries. This article describes their work here and how they are now practicing what they learned.

by **WILLIAM X. HULL**

On July 1, 1942, a group of agricultural specialists from Latin America began a down-to-earth training program in soil conservation under the direction of the Soil Conservation Service of the U. S. Department of Agriculture. The program was sponsored by the Office of the Coordinator of Inter-American Affairs in cooperation with the Department of State. The men, 25 of them, came from 13 different Latin American countries—the farthest from southern South America, the nearest from Mexico and Cuba. Here they are:

Ricardo Jahn Adoué	Venezuela.
Gonzalo Pedro Andrade	Mexico.
Alfredo Gustale Antonelli	Paraguay.
Mario Augusto Baracco	Peru.
Silvino Alqueres Batista	Brazil.
Luis Arturo Fernández	Costa Rica.
Carlos A. Fynn	Uruguay.
José Salvador Jáuregui	El Salvador.
Ricardo Alberto León	Mexico.
Anthony Lespes	Haiti.
Gonzalo Alfonso Moreno	Ecuador.
Rodrigo Gonzalo Orellana	Do.
Humberto Ortega	Mexico.
Javier García Paredes	Do.
Paulo Parisio de Melo	Brazil.
Casiano Víctor Quevedo	Argentina.
Manuel T. Rodríguez	Chile.
Sebastián Aníbal Romero	Venezuela.
José Antonio Rugeles	Do.
Fernando Sayán-Palacios	Peru.
Arturo Somoza	Argentina.
José Orlando Suárez	Chile.
Jadór Torres de Rezende	Brazil.
Lucio García Vásquez	Cuba.
Emilio Zamudio	Mexico.

The training course was limited to 1 year. In that time, each of the Latin American students wanted to learn, and was expected to learn, not only the reasons for soil conservation on all the agricultural land of the world, but the many details of applying it in the most practical and economical way.

In the limited time of 1 year, the best way to learn to be a soil conservationist is by doing. For this reason, each man, after a short stay in Washington, was sent to a soil conservation district work unit where conditions were reasonably similar to those of his own country. Here he became an integral part of the field staff, taking part in all activities involved in the program of the locality. As he worked, he was coached by the technical men of the Service. He was required to read and study texts and bulletins. He was encouraged to ask questions.

They Worked on and With the Soil

As the year of training moved forward, it became evident to both the students and the Service that the "grass-roots" plan of study would work to the advantage of all concerned. As a member of the work-unit staff, the Latin American student learned how to make the surveys necessary to soil conservation planning—soil surveys, erosion surveys, and conservation surveys. He learned the techniques of making land-capability maps and tables—red land, green land, yellow land—and how to apply these capabilities to the farm plan and the farmer's individual problems. He became familiar with agronomic, forestry, engineering, range, and wildlife practices as essential elements of a soil and water conservation program in any part of the world. He learned how to apply all these practices in planning, designing, and building terrace systems, water disposal systems, stock water and fish ponds, and conservation irrigation and drainage systems. Finally, he learned how to coordinate erosion control methods and practices in actual crop production on the field, farm, or group of farms, by following a definite conservation plan including such production methods as strip cropping, fertility-improving rotations, and pasture or rangeland rejuvenation and stabilization by the control of grazing.

As he learned these different soil conservation principles, he put them to actual use by working with the farmers and ranchers, discussing their problems with them, and making complete conservation plans for their farms. These farm plans include not only the necessary erosion-control practices but also a plan of cropping and rotations which will be of benefit to the land as well as to the pocketbook of the individual farmer.

Even at this point, his training was not yet complete, for he then had to lay out the work on the ground and,

Mr. Hull, a soil conservationist on the staff of the USDA's Soil Conservation Service, handles matters relating to soil conservation between the United States and foreign countries.

S. C. S. Photo

They learned by working with farmers and ranchers. Here, with the use of a conservation survey map, Silvino Batiste of Brazil discusses with Alfred Austin of Bentonville, Ark., the value of proper land utilization.

if necessary, build the terraces, lay out the strips, design and build the pond, or lay out and install proper drainage and irrigation practices. All of this called for close and intimate contact with the dirt. This training could not in any sense be called a white-collar job; each man came close to the earth, got his hands dirty, got the good old soil he was learning to save on his boots.

Areas Selected to Fit the Trainee

It is impossible to find in the United States locations where climate, rainfall, topography, and agronomic conditions coincide exactly with those of the Latin American countries. Efforts were made, however, to place the men in localities duplicating their home conditions as nearly as possible, so that upon their return to their own countries, they would not have to make too many adjustments in adapting the practices and principles which they learned with the USDA's Soil Conservation Service.

As the practices used in our country for conservation of soil and water do not all occur in any given locality, during the latter part of the time of each man's training and study he did considerable traveling, spending a few weeks at a time in several locations to learn such specialized practices as were thought necessary to round out his training as a soil conservationist in his particular country.

Typical United States Environment Provided

All the men upon their arrival in the United States were able to read English to a greater or lesser degree. Some of them could converse rather easily. It was the aim of the Soil Conservation Service to place each man in a small town, of 1,000 to 10,000 inhabitants, having within its limits a complete picture of a cross section of ways and life in the United States. Each man's first field station, where he remained from 4 to 6 months, was one of these typical U. S. A. towns—towns such as Elberton, Georgia; Seguin, Texas; Sunbury, Pennsylvania.

In these small towns the men came into close and intimate contact with our customs and life. They lived and boarded in typical North American homes. They went to the church of their choice. Several became members of civic clubs and attended meetings regularly. They entered into the social activities of the church, club, and community. This plan worked out very well. In all towns where the men were located they made hosts of friends; the people in the town learned as much from the visiting Latin American about his country as he did from them.

They Go Home to Apply Their Training

As this is written, all but 6 of the original group of 25 agricultural specialists have returned to their home countries. They are now soil conservation technicians. Six still remain in the United States in attendance at universities. That these men and their countries appreciate the opportunity afforded them to visit this country and to learn the principles and practices needed for the conservation of their soil and water, is expressed best in the present work which they are doing in their home countries. From letters received from them, and from reports from their governments, most of them are already getting "down to earth" in their homelands, and the battle to save the soil of their great southern countries is beginning.

The first man to complete his training was Anthony Lespes, an agronomist in the employ of the Department of Agriculture of the Republic of Haiti. Previous to his soil conservation studies in the United States he was engaged in work similar to that of our county agents. Upon his return to Haiti, he was appointed by his Government as "Agronomist, Specialist in Soil Conservation." From letters received from him, he is going ahead

S. C. S. Photo

Some of the trainees studied pasture and range management. Paulo P. de Melo and Jader T. de Rezende of Brazil examine some heads of Rhodes grass on a 550-acre pasture in Texas.

as rapidly as possible, formulating plans and putting into execution on the land and with the farmers those parts of his plans which are immediately applicable. He writes that he has a very hard job; the farm lands are very steep; rainfall is heavy and erosion tremendous; and most of his farmers are poor. But he is hopeful—hopeful of obtaining results before too many seasons have passed. He has prepared a proposed law to make payments to farmers for carrying out certain erosion-control practices, and hopes to get this passed by the legislature and into effect.

Ricardo Alberto León, Javier García Paredes, Emilio Zamudio, Humberto Ortega, Gonzalo Pedro Andrade—all agricultural technicians from Mexico—were next in completing their training. They returned to their country the latter part of August 1943. Paredes and Andrade went directly into the Soil Conservation Service of the National Commission of Irrigation under the Department of Agriculture. They are working in different states, making conservation surveys and farm plans under a plan prepared by their Soil Conservation Service. Zamudio is doing conservation work in forestry in the State of Yucatán. Ortega and León are at experiment stations, conducting work in connection with agriculture and conservation. They were all good students and hard workers while with us in the United States.

S. C. S. Photo

The good old soil they are learning to save is examined by Luis Fernández of Costa Rica, Sayán-Palacios of Peru, and Orville Hays, the SCS project supervisor at La Crosse, Wis.

CAN WE HAVE THE RIGHT FOOD?

(Continued from page 90)

easily stored and transported, they are convenient and comparatively cheap sources of energy.

Foods that are especially valuable as sources of good quality protein, and of minerals, and vitamins—such as milk and milk products, meat, poultry, fish, eggs, fresh fruits, vegetables, and legumes—are necessary to balance the cereal component of the diet. Grains in their natural form are excellent sources of the B vitamins and good sources of certain minerals and proteins, but these are removed in varying degrees by current methods of milling.

Cooperation of Individuals Needed

While governments have the responsibility of directing food policy so that adequate food supplies for the population are available, families and individuals must know how to make the best use of the foods and food resources available to them. Governments do not prescribe diets, except as it may be necessary to limit by rationing food stuffs in short supply. They do have the responsibility, however, of providing through all available educational channels education that will guide food choice.

Nutrition education should spread knowledge of good nutrition to all levels of the community. It should reach not only the consumers but those responsible for governmental action related to provision of food and everyone in a position to influence the consumer in his choice of food. This education should be adapted to the special needs of the different groups and given in terms of the food supplies available.

Rural families dependent upon the foods which they themselves produce should be encouraged to plan their supplies so as to have the kinds and amounts of food required for a balanced diet. Where only a portion of the family food is produced at home, emphasis should be placed upon the production of perishable foods of high nutritive value. Village and urban families should be encouraged where practicable to use any available plots for growing fresh vegetables and fruits, with emphasis on leafy, green, and yellow vegetables. In areas of seasonal production, methods of processing and storage should be used more widely so as to extend available supplies throughout the year. Finally, housewives must be helped in the development of methods of preparation which result in dishes not only palatable, but in which the nutritive content of the food is preserved. A variety of methods for spreading the basic facts about nutrition and food use can and should be employed.

In nutrition, as in agriculture, collaboration is desirable. Further research is needed. By cooperation and exchange of research information, research methods, and research workers this advance can be increased immeasurably. Right now we need more facts on food composition, more information on diets of groups in all areas.

But we are not putting into practice the facts we know, which emphasizes the need for collaboration in education. While programs will have to be adapted to the needs of countries and areas, the basic facts are the same everywhere. By working together in training nutrition workers and in the exchange of teaching materials, progress can be stimulated.

Potato Improvement in Peru

Peru, the home of many wild species of potato, has been the source of potato-planting stock used by horticulturists to improve varieties for cultivation in the United States—Irish Cobblers, White Rose, and Katahdin, to name a few. Even now, more than 400 years after the Spaniards first found potatoes growing in Peru, the progeny of Peruvian seed stock is coming back home for trial plantings which, if successful, will give the Peruvian potato producer a better yield, the consumer a better product, and the country as a whole a more adequate supply of this important food item.

The *Servicio Cooperativo Interamericana de Producción de Alimentos* of Peru has entered into a potato-improvement agreement with the Office of the Coordinator of Inter-American Affairs through the Institute of Inter-American Affairs, under which seed selectivity and breeding will be carried on in the various Peruvian experiment stations. Efforts will also be directed toward overcoming the century-old custom, which still prevails in some areas, of using the best potatoes for food and the culls for seed stock.

In the Huasa-Huasi area of Central Peru, 12,000 feet above sea level, some of the Indians still cultivate their crops on mountainside terraces much as their forefathers did hundreds of years ago. The *taclla,* or footplow, which penetrates to a depth of only about 4 inches, is still used; produce moves to market by llamaback, which is the only means of transportation. Seed potatoes often consist of tubers only ¾ of an inch in diameter and are planted very close together in the row, sometimes two or three in one hill. Although much time is devoted to the preparation of the soil, the actual cultivation is relatively light because of the kind of implements used.

The land devoted to potatoes is generally low in organic matter. In some places guano is applied to the soil, or lambs are pastured on the potato fields during the winter. Fallowing is a common practice on the higher elevations of this area.

Potato culture varies in the different parts of the country. In most sections only one planting is made during the year. On the coastal plain near Arequipa, however, three plantings may be made according to the time harvest is desired. But the most important planting time for this section is January, for June harvest. Smaller acreages are planted in September or October and in June or July. In the valleys and canyons a crop can be planted under irrigation several months earlier than plantings in the higher, colder regions which must rely upon rainfall. This early irrigated crop, known as "*papa mayhuay,*" is planted during July and August for harvest the following February and March. Irrigation, however, is not dependable because of the limited amount of water available for such purpose.

Along the coast, potatoes are grown as a winter crop

A view of the potato-growing area in Huasa-Huasi Valley of Central Peru. The elevation is 12,000 feet. Potatoes are growing in the Indian terraces in the background, accessible only by llama train.

by planting them in April for harvest in August and September. Although this coastal region is not a major producing area, modern equipment is used here to a greater extent than elsewhere.

In the high Sierras, planting takes place at the beginning of the rainy season after danger from frost is past, which usually is in November or December. The harvest season is May. Despite precautions, however, to avoid frosts at these elevations, the plants in the Puno region, near Lake Titicaca, are frequently nipped.

From the above recounting of planting dates, it is obvious that Peruvians could enjoy new potatoes the year round, and this is one of the aims of the Peruvian-U. S. agreement.

The Department of Junín, with an annual surplus of approximately 915,000 bushels, is the chief supplier for cities and deficit areas. The margin between annual production and consumption for the country as a whole, however, is so small that even a slight decrease in yield makes it necessary for Peru to import this commodity.

An important phase of potato-improvement work will be more effective control over insect pests and diseases, along with the selection of varieties or even plants that have high disease resistance. Solution of these problems will make for higher yields, which, in certain areas of the Sierras, have been as low as two sacks harvested for each sack planted. The average yield for the country, however, was estimated at 41 bushels in 1929, the last year for which data are available, with yields in certain sections of the Department of Junín averaging as high as 115 bushels per acre.

Although there is a large number of so-called varieties of potatoes grown in Peru, they have not been standardized and do not constitute what are generally considered to be distinct and recognized varieties. Therefore, standardization, along with seed selection, breeding, and insect and disease control, is another objective of the cooperative potato-improvement program.

LAGUNAS—BARBASCO CAPITAL OF THE WORLD

(Continued from page 86)

sale is for cash, at other times for the repayment of a loan of money or of goods which the farmer had to borrow to tide his family over. Almost never are the roots taken from the ground unless a bargain has been made and the purchase price settled. Sometimes a local storekeeper or trader will buy. If the crop is ready for harvest, the likely purchaser will be the *regatón*.

The "Regatón" or Traveling Salesman

The regatón is an Amazon institution. He is the counterpart of the North American traveling salesman. Combing all of the rural areas, from headquarters in the larger commercial cities, he both buys and sells. Some *regatones* operate on their own; others have shoestring connections with large importing and exporting houses. Their number is legion, and there is not a product on the Amazon which they cannot corral with the persisting efficiency of the tropical leaf-cutting ant, if there is a profitable market for it.

Regatones travel by canoes, balsas, and the commercial steam launches. Dozens of them descend upon Lagunas every month. Upon arrival they operate in a manner similar to that of the itinerant cattle and egg buyers in rural Wisconsin. They have a good "line," flavored with cozy river gossip, which guarantees to put the farmer in a frame of mind to sell his crop at the lowest price. Once the bargain is struck, the roots are harvested by the farmer and his neighbors. The *regatón* departs a few days later with his collection, which usually averages only a few tons. This he may ship in huge dugout canoes, which will hold a ton, or on a balsa, which will carry 2 or 3 tons. If the *regatón* is buying for a large exporter, he will usually lump his purchases with those of others from the same house and ship by commercial steamboat. In any case, he will proceed day and night for 2 or 3 days, aided by the swift currents of the Huallaga, the Marañon, then the Amazon itself until he reaches Iquitos, the chief shipping center in the Peruvian Oriente.

At Iquitos, Peru, the barbasco is wrapped for export through the ocean port of Belém, Brazil.

In keeping with the barbasco enthusiasm of Lagunas is the schoolyard plantation of the public school children established to raise a fund for the purchase of textbooks. In another year these grade-school pupils will have a field day to harvest their crop, which has been a sort of collective 4-H Club project.

Plant Improvement Needed

Around Lagunas there are approximately 2,500 acres of barbasco—roughly a third of all the barbasco now

(Continued on page 96)

Reading about the AMERICAS

Alimentos y Alimentación. Translation by Alfonso Castro G. H., *Sociedad Nacional de Agricultura* of Chile. 2,000 pp. Published by the *Corporación de Fomento de la Producción,* Chile; 1943.

This is a first-time translation into Spanish of *Feeds and Feeding,* a standard text on livestock feeding written in 1898 by the late W. A. Henry, formerly Dean of the College of Agriculture and Director of the Agricultural Experiment Station, University of Wisconsin. *Feeds and Feeding* has gone through 20 editions. Beginning with the tenth edition, F. B. Morrison, Professor of Animal Husbandry and Animal Nutrition, and Head of the Animal Husbandry Department, Cornell University, assisted in the rewriting, and with the fifteenth edition Professor Morrison took over completely the revising and rewriting.

In Part I the author presents the fundamental principles of animal nutrition and their bearing upon the practical feeding of livestock, and explains the method of using the Morrison feeding standards. Part II gives comprehensive information concerning the composition, properties, and use of all common feeding stuffs used in the United States. Part III presents the most important findings of the experiment stations of this and other countries on the feeding and care of livestock. An appendix contains extensive tables of up-to-date data on the average composition and the content of feedstuffs.

The book was translated into Portugese, in Brazil, in 1907 and into Russian, in Russia, in 1912. In authorizing the translation of his book into the Spanish language, Professor Morrison stated, in part, "I am glad to authorize a translation to be made by Mr. Castro, with the specific condition that the book is to be published and distributed by the Chilean Government at cost and that it is to be sold on a nonprofit basis." Accordingly, this book is now for sale by the publishers at 160 Chilean paper pesos, or roughly $5. The *Corporación de Fomento* has sent complimentary copies of this new translation to Government officials, agricultural schools, and farm societies of the other American Republics.

Pan American Day, compiled and edited by Hilah Paulmier and Robert Haven Schauffler. 327 pp. Dodd, Mead & Co., New York; 1944. Schools, libraries, and people preparing programs have long been familiar with Mr. Schauffler's series "Our American Holidays." *Pan American Day* is a welcome addition to the series. It is an anthology of prose and verse, including material on the 21 republics, the history of Pan Americanism, and the Good Neighbor Policy. It contains anecdotes, legends, stories, selections from speeches, and many pages of suggestions for plays, a pageant, and programs of various kinds.

Hacia la Revolución Agraria. La Reconquista de la Tierra, Cuban Ministerio de Agricultura. 30 pp. La Habana, Editorial Guerrero; 1943. The pamphlet, in Spanish, contains recent legislation aimed at guaranteeing the existence of the small farm in Cuba and facilitating the acquisition of land by farmers. Two messages on the subject by J. Martínez Sáenz, the Minister of Agriculture, are included.

Vegetable Fats and Oils, George S. Jamieson. 508 pp. Edition 2. Reinhold Publishing Corporation, 330 West Forty-Second Street, New York; 1943. No. 58 of the American Chemical Society Series of Scientific and Technologic Monographs. The stated purpose of the monographs is to present the knowledge available on the chosen topic in such a form as to be intelligible to

---

(Continued from page 95)

planted in Peru, which is the leading exporting country of this product. The first commercial barbasco plantings at Lagunas in the early 1930's were made with propagating material gathered from fish-poison plantings in the neighborhood. Until recently no scientific effort was made to select high rotenone-producing *L. utilis.* Consequently there is much room for improvement in the quality of the plants grown. By and large, barbasco is still regarded as a semijungle product from the time it is planted until it is exported, but there are signs of change.

Iquitos exporters, for example, are beginning to improve their drying and packing methods. They are also interested in roots of higher rotenone content, since they sell the exported product on the basis of its rotenone percentage. As yet, however, the farmers of Lagunas and elsewhere on the Amazon plant "run-of-the-mill" *estacas,* with the result that the rotenone content of air-dry roots now exported is reported by Iquitos shippers to average only 5 percent.

In 1943 shipping space to accommodate increasing barbasco exports became a problem for Amazon river boats, which make the run down the Amazon, some 2,300 miles, from Iquitos to the ocean port of Belém, Brazil. In September there were more than 1,000 tons backed up in Iquitos warehouses because of heavy river traffic. This congestion was temporarily relieved in October, but the problem of how to move barbasco will become even greater in 1944, when exports should top 2,000 metric tons.

While the average North American tractor farmer may never get to know the machete-wielder of Lagunas, they do have some things in common in meeting wartime agricultural needs.

ALONG THE *Agricultural Front*

▲ Health School Opened at Iquitos, Peru

At a recently established technical training school at Iquitos, Peru, 35 students are training to serve as sanitarians in the inter-American health and sanitation program. This is part of the general health and sanitation program undertaken by the Institute of Inter-American Affairs in collaboration with 18 other American Republics to support economic development and strategic hemisphere defenses.

The school at Iquitos is the sixteenth to be opened in Latin American countries for the training of personnel for malaria control, health centers, hospitals, dispensaries, and related work. The training activities are carried out by a special technical service for inter-American cooperation established in the countries participating in the program and in which the Pan American Sanitary Bureau and private organizations are assisting.

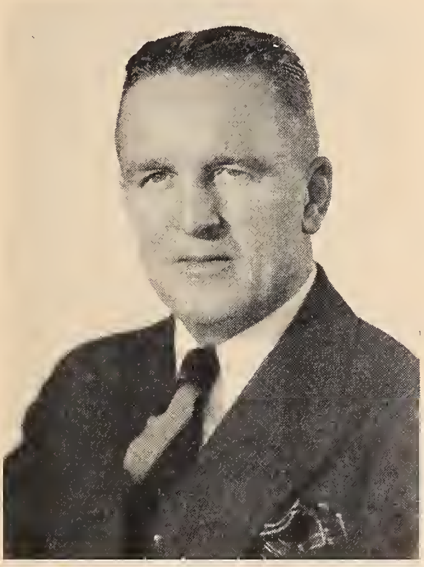
▲ White Niagara Grape Produces a "Sport"

Many years ago white Niagara grapes were introduced into Brazil from the United States. Now comes a report that the attractive red grapes that have been showing up in the Rio de Janeiro and São Paulo markets are a "sport" of the white Niagara. In everyday usage there are many definitions of a "sport," but in the world of genetics a sport is a deviation from the parent stock, or, more technically, a mutation.

The vines and fruit of the new red Niagaras are said to be the same as the white in size, shape, and taste, but the attractive color presents a better appearance on the market. These grapes ripen early in December and are used, quite appropriately, to help express the holiday season. Another reason for their popularity is that they are harvested at a time of year when other grapes are in short supply.

Arrangements have been made by the USDA's Plant Introductory Gardens to have cuttings brought back to the United States for testing purposes.

AWARDS FOR SERVICE



Atherton Lee, who recently resigned from the service of the U. S. Department of Agriculture to accept the position of director of the Department of New Crops of the United Fruit Co., has been awarded decorations by the Governments of Haiti, Dominican Republic, and Ecuador for outstanding services to the agriculture of those countries. Through the introduction of new crops of commercial value Mr. Lee has made material contributions to the economic welfare of the three countries indicated.

The decorations are:

- Order of Honor and Merit, Government of Haiti, 1939.
- Order of Juan Pablo Duarte, Government of Dominican Republic, 1941.
- Order of Agricultural Merit, Government of Ecuador, 1941.

Now that Mr. Lee does not hold an office under the United States Government, he is free to accept from these neighboring countries the decorations earned in carrying out his job of promoting a practical phase of the Good Neighbor Policy.

▲ New Cold Storage Plant for Brazil

The Director General of Brazil's National Department of Ports, Rivers, and Canals has obtained bids for the construction of a cold storage plant at the port of Natal in the State of Rio Grande do Norte. The plant is to have a total covered area of about 38 square rods. It will have the capacity to produce 6,613 pounds of ice and to treat and freeze 4,755 quarts of milk daily. There will be cold storage space for about 91 tons of meat, 9 tons of fish, 4½ tons of fruit, 3 tons of eggs, and 300 barrels of beer.

▲ Ecuador Provides Courses in Agronomy

By a decree dated October 6, 1943, Ecuador's Ministry of Public Education has been empowered to establish in the *Colegio Nacional Nueve de Octubre* of Machala a course of study in agronomic science. By the same decree the Ministry was authorized to designate two professors to direct classes on this subject.

---

those whose activities may be along a wholly different line. To this end, an index of botanical names is given.

The author explains the chemistry, production, and utilization of vegetable fats and oils for edible, medicinal, and technical purposes. Under the groupings of nondrying fats and oils and semidrying oils, individual oils are considered. Many of them are shown to come from seeds of trees or plants growing in Central and South America, Mexico, and Islands of the Caribbean.

In this second edition the arrangement of the subject matter is the same as that used in the previous edition, but in some cases the descriptive matter has been rewritten either wholly or in part. Information has been brought up to date by including many added fats and oils and methods of procedure for their extraction.

▲ Plywood Industry Increases in Brazil

Brazil's plywood industry has grown tremendously since the outbreak of the war, to meet the South American demand previously supplied from European sources. Although plywood has been used in Brazil for many years, the use of this product up until recent years was limited to furniture veneer and wainscoting. There is no record of exports.

Then modern ideas in furniture and interior decoration began to increase the local demand, and a new market arose in England for plywood in temporary war construction. When the war upset the usual sources of importation, the Brazilian industry stepped up production to meet these two demands.

According to data received from Brazil there are at present 98 plywood factories in operation and an additional 134 are being installed, whereas before the war few, if any, factories limited their operations to the manufacture of plywood. The capacity of the 98 factories now operating is rated at 989,399 cubic feet monthly, and the 134 new factories have an estimated capacity of 2,826,890 cubic feet per month. Nearly all Brazil's plywood factories are located in the States of Paraná, Santa Catharina, and Rio Grande do Sul.

▲ Mexico Project Grows Crops Despite Dry Season

The March 1944 issue of Agriculture in the Americas carried a story by D. Spencer Hatch about a general rural development project at Camohmila Center near Tepoztlán, Mexico. A recent report from this author gives an account of crop conditions at Camohmila as follows:

"Camohmila looks like an oasis now [March 1944] when all fields as far as one can see are absolutely brown and bone dry. Immediately after the corn and other crops were removed and rains had entirely stopped, we disked into the top surface the weeds which had come up in abundance. No plowing. Onto the disked surface we sowed, in one section buckwheat, and in other sections barley. In due course we harvested the buckwheat, and the barley is now coming to full maturity. This surprising demonstration of retaining moisture to grow a crop during the season when crops don't ordinarily grow is due to the organic material disked in near the surface not only retaining moisture there, but drawing deep soil water from below."

▲ Toads and Fish Eggs Travel by Airplane

A recent shipment of live toads from Argentina to Florida and of fish eggs from Ohio and Michigan to Peru by airplane would seem to help evidence the versatility of air transportation.

The toads, 70 of them of the genus *Bufo paracnemis* and *Bufo arenarum*, boarded a plane at Tucumán, Argentina, during the first week of March and arrived at Miami, Fla., 3 days later. Only one died in transit. They are to be used experimentally near Clewiston, Fla., in the control of insect pests such as the sugarcane borer and potato weevil which adversely affect the production of sugar, molasses, and starch.

The fish-egg shipment consisted of 150,000 whitefish eggs from Ohio and 60,000 lake trout eggs from Michigan. They are reported to have arrived in perfect condition at Limatambo Airport, Lima, Peru, on last January 21. The eggs were a gift of the Ohio and Michigan State Governments to the Peruvian Government and were destined for the International Fish Hatcheries at Chucuito on Lake Titicaca.

▲Colombia Farmers Urged to Increase Production

In an effort to obtain a 10 percent increase in the production of farm products and livestock in Colombia a drive toward this end has been launched by the *Sociedad Antioqueña de Agricultores* among farmers and cattle raisers throughout the country.

▲ Dried Bananas May Add to Food Supply

In a report to the Inter-American Development Commission, Washington, D. C., Donald F. Othmer of the Polytechnic Institute of Brooklyn, N. Y., suggests that dehydration of fruit now being wasted in the banana-growing countries of Central America may offer a source of food to help meet the world's post-war food needs. The report is based on studies of banana utilization made in Honduras last year.

Mr. Othmer, a chemical engineer and authority on acetic acids, explains that bananas can be preserved by simply removing about 75 percent of the water content. "The drying operation," he says, "may be conducted on the whole fruit after peeling. Or the bananas may be pulped or emulsified before drying in a spray drier. These operations give a fine powder."

Dehydration of bananas, the report points out, permits preservation and storage of the fruit during periods when banana stems cannot be shipped.

▲ Two More Countries Sign up for Ag Institute

Two more countries have signed the Convention for the establishment of the Inter-American Institute of Agricultural Sciences at Turrialba, Costa Rica. The two new signatories are El Salvador and Guatemala, bringing to a total of ten the number of American Republics that have signified approval of establishing the Institute whose purpose is to encourage and advance the development of agricultural sciences in the Americas. Costa Rica, Nicaragua, Panama, Cuba, Ecuador, the Dominican Republic, Honduras, and the United States signed the Convention on or shortly following January 15, 1944, when it was opened for signature at the Pan American Union.

In May 1913 the first South American International Conference on Agricultural Defense opened in Montevideo, Uruguay.

AGRICULTURE IN THE AMERICAS STANLEY H. GAINES, EDITOR

A monthly publication of the Office of Foreign Agricultural Relations of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 10 cents per copy, or by subscription at the rate of 75 cents per year, domestic; $1.20 per year, foreign. Postage stamps will not be accepted in payment.

U. S. GOVERNMENT PRINTING OFFICE: 1944

Gifts of the Americas

THE GUAVA

by FRED A. MOTZ

The guava (Psidium guajava), like many of its jungle associates, is no homebody. Since its existence was first reported in 1526 it has traveled far. Indigenous to the Americas, possibly from Mexico to Peru, it has been distributed to practically all tropical regions of the world, occurring as a semiwild plant in many places. At an early date the plant was taken to India, where it has become naturalized. Since then the guava has spread to the tropics and subtropics of southern Asia, South Africa, the Orient, parts of the Mediterranean, Hawaii, Florida, southern California, and elsewhere.

In the first written account of the guava the tree was described as "handsome," the flowers "fragrant," and the fruit "beautiful and appetizing." The guava, while useful in many ways, has been recognized preeminently as a fruit for jelly making and other culinary purposes; but now, more than 400 years later, the discovery has been made that it is one of our richest sources of Vitamin C. Tests show that a product made from this fruit, guava powder, is so rich in vitamin C that 4 ounces of it would protect an Arctic explorer from scurvy for almost 3 months. Allied troops are supplied with guava products in emergency rations to help maintain resistance against infection.

The guava belongs to the myrtle family and is described by botanists as a myrtaceous fruit. This family includes many of the spices, as clove, cinnamon, allspice, and nutmeg. The Aztecs of Mexico called it *xalxocotl,* meaning sand-plum. The name *guayaba,* from which the English guava is derived, is believed to be of Haitian origin and is used throughout the Spanish-speaking parts of tropical America. The French have adopted the name *goyave*, the Germans *guajava*, and the Portuguese *goiaba*. In the Orient there are many local names, some of them derived from the Latin American *guayaba*.

Guavas can be eaten in many ways: Out of the hand like an orange; sliced with cream like peaches; stewed or preserved. They also make good shortcakes and pies. The greatest commercial use of the fruit, however, is for jelly. Properly made guava jelly is deep wine-colored, clear, and of very firm consistency. In Brazil a thick jam, known as *goiabada*, is manufactured and sold extensively. A similar product is made in Florida and the West Indies and sold as guava cheese or paste.

Considerable interest is being shown in the supply of guavas in Cuba, where the fruit is being gathered in large quantities for dehydration. The powder is being used to fortify jams and jellies made from other fruit for use by the armed services. Cultivation of guavas has also increased in South Africa because of its high vitamin C content.

Since most guavas in the Americas are produced in a semiwild to wild state, there are considerable variations in the fruit. The vitamin C content varies from month to month in relation to maturity and also according to variety. Tests made from fruit harvested early in the season show a vitamin content of 350 units (milligrams of ascorbic acid per 100 grams of fruit) as against 900 units from fruit harvested later in the season or after it has become more mature. Pink guavas are believed to have a greater vitamin content than the white or salmon-colored varieties. Tests show also that the richest source of vitamin C is in the peel, and that the outer flesh has a much higher concentration than the seedy flesh in the center of the fruit.

The plant itself is a treelike shrub and sometimes grows to be 25 or 30 feet high. The trunk is slender with a greenish-brown scaly bark. The fruit, which looks somewhat like a pear, is produced on the small branches. The guava is a heavy bearer, and harvesting extends over a long period. In Florida and the West Indies it is gathered in late summer and autumn. Seedlings start bearing at 3 or 4 years of age, while budded plants may bear fruit the second year after planting. Although the guava may live and bear fruit for as long as 40 years, its heavy-bearing life averages only 20 years or so.

The guava succeeds on a wide range of soil. It does well on red clay in Cuba, on adobe soil in California, and on very light and sandy soil in Florida. While not strictly tropical in its requirements, it does not survive temperatures that fall below the freezing point.

Unfortunately, the guava is susceptible to a number of diseases and insect pests. While some of them, such as scale insects, can be controlled by the proper use of insecticides, little attention has so far been given to this matter in tropical countries. Because of fruit-fly infestation rigid quarantine restrictions exist against the importation of the fresh fruit into the United States. With the new discovery, however, that this fruit contains such a high volume of an important vitamin, there will undoubtedly be an increased interest in its cultivation.

COSTA RICA

Costa Rica, a Central American Republic about the size of West Virginia, lies between Panama on the south and Nicaragua on the north. Two mountain ranges of the American Cordillera run from southeast to northwest across the country and enclose a central plateau ranging from 3,000 to 6,000 feet in height. The plateau is drained on the Atlantic side through the Reventazón River Valley, and on the Pacific side by the Río Grande de Târcoles.

Climate

Because of its location in the Tropics, Costa Rica's climate is determined by altitude. The coastal lowlands are hot, and in the Atlantic region, where humidity is high, rain falls throughout the year, averaging from 117 to 255 inches annually. From May to November, the Pacific coast receives from 43 to 126 inches, and the central plateau an average of 79 inches.

The People

The population of the entire country is about equal to that of Pittsburgh, Pa., or just under 700,000. More than two-thirds of the people live in the central highlands on about one-third of the country's area. Eighty percent of the people are white, descended from the original Spanish settlers; about 14 percent Mestizos, mixed white and Indian; and about 4 percent Negro. The Negroes are concentrated on the coasts, largely on the Atlantic side, where they work on the banana plantations.

Mining and Agriculture

While the mineral and forest resources are extensive, they are little developed. Gold, silver, copper, manganese, iron, nickel, mercury, coal, and sulfur all are found in Costa Rica, but only gold is exploited. Mahogany, cedar, and rosewood furnish wood for domestic furniture; cedar, balsa, and cocobolo (a species of rosewood) are the principal forest exports. Other forest resources include oak, ebony, rubber, and fustic.

Although only about 7 percent of the land area is under cultivation, Costa Rica is predominantly agricultural. Coffee and bananas are the principal commercial crops, together accounting for 90 percent of total export value in normal years. Fine quality mild coffee grows on the Meseta Central at an elevation of about 4,000 feet, and in the Turrialba region coffee production extends down to within a few hundred feet of sea level. The center of the coffee-growing area is also the population center.

Bananas for export are produced on the coastal lowlands. The older banana-growing region is on the Atlantic coast, but because of damage by sigatoka disease there, production on the Pacific coast is increasing.

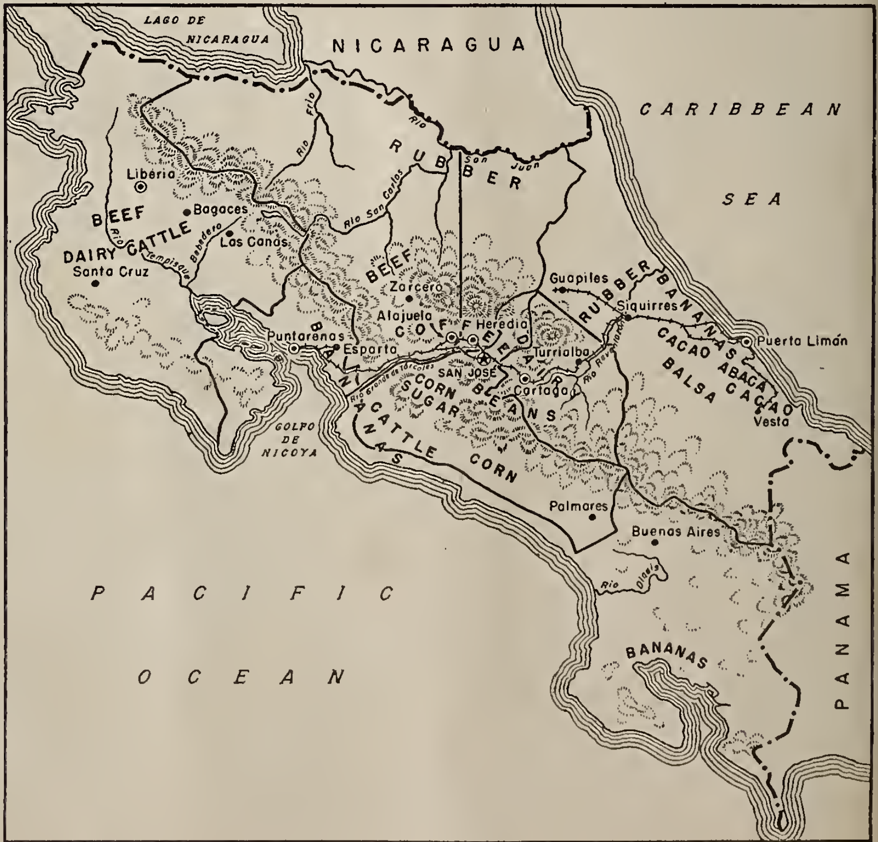
The third commercial crop is cacao which is cultivated in the Province of Limón along the railroad from the city of Limón west to the Reventazón River as well as in areas southeast of Limón to the boundary. Disease has been a serious factor in reducing cacao production in recent years.

Beans, rice, and especially corn—three staple articles of the local diet—are all grown in sufficient quantity for domestic use.

Sugar, tropical fruits and vegetables, lentils, coconuts, and yuca are also grown for domestic use. Some food products are imported, the most important of which are wheat flour and fats and oils. Because of shipping difficulties during the war Costa Rica has rationed flour for certain periods in an effort to stretch available supplies. Meat and livestock products also have been in short supply during the war. Beef cattle are grazed in the Province of Guanacaste, the principal producing region, and on the Atlantic lowlands. Dairying is more important, however, on the slopes of the mountains bordering the Meseta Central.

The United States Government is working with the Costa Rican Government to increase the production of fresh fruits and vegetables for shipment to the Canal Zone, and to encourage the production of rubber and cinchona for export to the United States. In addition, the Costa Rican Government has enacted legislation (November 1943) designed to encourage national production of basic foods such as corn, rice, beans, and potatoes for home consumption. The law provides that a fund be set aside to guarantee to contracting farmers the purchase of these commodities at a price to be fixed by the National Bank of Costa Rica.

Turrialba, not far from San José, is the home of the new Inter-American Institute of Agricultural Sciences. This Institute aims to carry out applied research and educational activities of benefit to all the Americas.



RARY
ERIAL RECORD

Agriculture IN THE Americas

Issued Monthly by the OFFICE OF FOREIGN AGRICULTURAL RELATIONS
UNITED STATES DEPARTMENT OF AGRICULTURE

IN THIS ISSUE

	PAGE
Mexico's Cattle Industry	103
Toward Practical Cooperation	107
Naranjillas	110
The White-Winged Dove	113
Along the Agricultural Front	117
Gifts of the Americas—Orchids	119

June 1944

NAMES & NEWS

Agricultural Mission to Colombia

Lawrence W. Witt, an agricultural economist, *Raymond E. Culbertson,* an agronomist, and *Henry G. Lewis,* a soil technologist, all of the Office of Foreign Agricultural Relations, are on an agricultural mission in the Republic of Colombia to work with experts of that country toward development of agricultural resources, particularly the production of crops that are complementary to those of the United States.

In this cooperative undertaking assistance will be given to existing Colombian agencies and consideration will be given to the organization of such new agencies as may be required to provide a technical base for comprehensive agricultural planning and development. Agencies coming within this scope will include those concerned with increased production of tropical or complementary commodities, efficient water utilization, colonization and settlement, agricultural experiment stations, and agricultural credit and marketing. Seeds, plant stocks, and plant specimens will be collected and sent to Washington for propagation and scientific study. The work of the mission is expected to require approximately 1 year.

Land-use Study in Colombia

R. Earl Storie has gone to Colombia on sabbatical leave from the University of California to assist Colombian soil technicians, particularly the members of the *Instituto Geografico Military Catastral,* in developing and improving soil-research methods, analyzing land-use problems, classifying soil types, and in other problems relating to the soil. A study of land utilization as related to the production of complementary crops will be a part of Mr. Storie's objective. This assignment, which is under the auspices of the Colombian Government, will last for approximately 5 months.

Assignment to Tingo María

Bowen S. Crandall, pathologist of the USDA's Office of Foreign Agricultural Relations, has been assigned to the Peruvian-United States Experiment Station at Tingo María, Peru, where he will study causes and prevention of diseases that adversely affect the production of cinchona, the source of quinine. Another part of his job will be to assist in the selection and development of high-alkaloid, disease-resistant planting stock for future plantings. The experiments which Mr. Crandall will conduct in Peru are expected to be of such a basic nature that many of the findings will be applicable in other South and Central American countries.

Students From Brazil

Four more students have arrived from Brazil to study agriculture in the United States as guests of the CI–AA's Food Supply Division. They are *Juliao Oschery* of Rio de Janeiro, and *Demosthenes Silvestre Fernandez, Jefferson Fereira de Carvalho* and *Amelio Smith,* managers of a Seed Production Field of the State of Maranhão, Brazil.

Oschery will spend several months with the Associated Seed Growers Inc., at New Haven, Connecticut; Fernandez and Carvalho, respectively, will study rice and poultry production here in the United States, while Smith will devote his time to general agriculture at Orange, Virginia.

Agriculture IN THE *Americas*

Vol. IV • JUNE 1944 • *No. 6*

Mexico's Cattle Industry

At the present time the annual cattle production of Mexico ranks second in value only to corn in the agricultural and livestock economy of that country. This article discusses the various phases of cattle production in Mexico.

by ESTHER H. JOHNSON

One of the oldest cattle industries in the Western Hemisphere is that of Mexico, our neighboring Republic south of the Río Grande. Cattle were first brought to Mexico in the early part of the sixteenth century, and although production trends have shown occasional severe reversals, the number on farms and ranches at present is estimated to be about 12 million head. The value of the annual calf crop is estimated roughly at $25,000,000 and so far as agriculture and livestock are concerned this value is exceeded only by the estimated value of annual corn production.

Before the discovery of America the only domesticated animals known to exist on the North American Continent were the turkey and the dog. Cattle, unlike many of the important crops, such as corn, potatoes, and tobacco, were not indigenous to America but were brought here soon after its discovery by Columbus, who on his second voyage, in December 1493, brought some animals from the Spanish Peninsula to Santo Domingo. Although the exact time of the introduction of cattle into Mexico is not known, records show that Gregory Villalobos, then Captain General of Mexico, brought cattle over from Santo Domingo in 1521 and that later importations were made by Coronado, Onate, and Fray Marcos. The present city of Cuernavaca, meaning "Cowhorn," is located on the original ranch of that name established by Cortez with cattle brought from his ranch in Cuba.

The foundation stock of Mexico's cattle industry easily became adjusted to Mexico, where climate and topography resemble those of the Spanish Peninsula, their earlier home. On the broad unfenced grazing lands of Mexico they multiplied rapidly.

Coronado Takes Cattle Northward

Wherever the Spanish went they wisely took livestock with them. Only a decade or so after Villalobos had brought cattle to Mexico Coronado rounded up 500 head, in addition to thousands of sheep, goats, and hogs, and took them with him on his search for the "seven golden cities of Cibola" in what is now New Mexico. These probably were the first cattle to enter the present area of the United States.

On the long trip northward through Mexico, Coronado left a number of animals along his route. Before the end of the sixteenth century thousands of cattle were reported as running wild in the States of Sinaloa, Durango, and Chihuahua. These wild herds of cattle which roamed over the vast pasture lands of northern Mexico became the nucleus of the feeder cattle later to be exported to the United States.

Many Breeds Imported

During the Colonial period nearly all importations of cattle into Mexico were from the Spanish Peninsula but, later on, some importations were made from other European countries. Although the first Brown Swiss are said to have been imported back in 1870, only during the past 15 years have the larger importations of this breed been made. This breed is used mostly for dairy purposes but is favored along the hot coastal regions for beef production. Shorthorns were imported principally for milk at first but in 1874 importations for meat purposes were made into the State of Chihuahua. The first Herefords are said to have been brought in in 1876, the first Devonshires in 1879, Galloways in 1880, Dutch Belteds in 1882, and Brahmas in 1884. Red Polled cat-

---

Miss Johnson is with the Livestock Unit of the Office of Foreign Agricultural Relations. This article is based largely on a report submitted by Mervin G. Smith, of the United States Embassy at Mexico City.

Here are Hereford cattle on terrain that is typical of certain parts of northern Mexico.

tle were introduced in 1910, and in 1928 Aberdeen Angus and Charolais, the French breed, were introduced. At the present time, nearly all the important breeds of the world have been introduced into Mexico. Records show, however, that only since 1920 have imports of good breeding stock been made on a fairly large scale.

Cattle are produced in every State of Mexico. The five leading States for this industry, according to the 1940 census, are Jalisco, Veracruz, Chihuahua, Michoacán, and Sonora. Contrary to common belief the largest concentration is not in the northern States of Mexico but in the central part of the country in the vicinity of Mexico City. There are, however, more cattle per capita and larger individual herds in the northern part.

Production for Export

The larger ranches in the northern part of the country produce most of the cattle that are exported to the United States, and livestock management practices here, quite naturally, are similar to those north of the Río Grande. Because droughts are more prevalent in north-central Mexico than in other parts of the country, more pasture land is needed per animal; hence, the large acreage per ranch. Many of the ranches in northern Mexico contain 50,000 to 175,000 acres. The number of cattle on each ranch varies from 400 to 10,000 head.

Most of the cattle that graze on Mexico's northern range lands are of the beef type and have been bred up through the use of purebred bulls, principally Herefords. Current estimates are that 60 percent of the cattle in the States of Chihuahua and Sonora are practically purebred Herefords. The owners of many of these northern ranches originally came from the United States or have spent considerable time in the United States, thus becoming familiar with breeding practices here and the qualities desired by the United States market.

On many ranches definite breeding and management programs are followed. Calves are usually dropped in February, March, and April. Some of them are vaccinated when they are only a few weeks old; all dehorning, castrating, branding, and vaccinating usually takes place before fall. Then, by early winter and spring they are ready for export as feeder cattle. In order to carry out such a controlled breeding program, ranches are fenced and the bulls kept separate during certain months. On some of the better ranches even the female cattle of different ages are kept separate.

Pasture for cattle in Mexico varies from luxuriant cultivated grasses to the more or less woody types of vegetation. The grama grasses comprise the most important native forage but numerous other types are also found. One of the most important shrubs and dry-climate plants is mesquite. During the dry season some cattle get their entire nourishment from mesquite and similar plants. Although the number of pasture acres required per head varies in different parts of Mexico, the usual carrying capacity of much of the land in the central and northern parts of the country is one head on 10 acres or more.

Marketing Requirements

During the past 5 years, from one-fifth to one-fourth of all cattle produced in Mexico have been exported, largely to the United States. The customary practice in carrying on this export trade is for the ranchers in the northern part of the country to maintain contacts with prospective buyers in the United States, who look to these ranchers for cattle supplies. Smaller producers often sell to special buyers who make a business of buying the stock from the smaller ranches. These buyers assume the responsibility of transporting the cattle across the rboder and selling them to United States buyers.

Cattle are dipped at Ciudad Juarez. Mexican veterinary inspectors test the strength of the solution and certify that the job is well done.

The man who sells cattle in export trade must obtain certain documents and permits from the Mexican authorities before shipment is made. When the cattle arrive at the border they are inspected by both Mexican and United States veterinarians. If the animals are found to warrant a clean bill of health, a proper certificate is issued. If scabies is detected, the animals must be dipped in a solution of lime sulphur. If they have fever ticks or come from an infested area, they are dipped, before entry, in an arsenical solution.

A customhouse inspector checks the number of cattle at the border and makes out appropriate forms for paying the customs charges, including inspection fees, export tax, etc. The customs broker pays the expenses, after which a certificate for passing the cattle across the border is issued by the Mexican customs officials. As soon as the cattle have been driven on foot or transported by rail across the border, as the case may be, a United States customs broker takes charge of them. If considered necessary by the United States veterinarian inspectors, the animals are dipped again on this side.

Two Types of Entry

Cattle are imported from Mexico under two types of entry, known in the vernacular of the industry as consumption entry, and bonded entry. Under the so-called consumption entry a consumption-entry bond must be posted with the customs officials when the cattle are entered. This bond is based on the value of the cattle plus the duty and serves as a guarantee against any irregularities in weight or other matters pertaining to entry.

Under a bonded, or warehouse, entry a bond is posted with the customhouse amounting to twice the amount of the duty and, regardless of when paid, is based on weight at the time of entry. Under this arrangement the cattle can be put in a bonded pasture for as long as 3 years. If an owner wants to sell some cattle from this bonded pasture, he can do so by paying the required duty. Before the cattle are sold, however, they must be inspected again and counted by customs inspectors, which procedure is required also when cattle are transferred from one bonded pasture to another.

The bulk of Mexican cattle entering the United States are young male animals, usually between 1 and 2 years of age and weighing between 200 and 700 pounds. The exportation of female stock has been discouraged for some time by the imposition of an export tax of $4.12 a head for females less than 6 years old.

High prices in the United States, the agreement of January 31, 1943, reducing the U. S. import duty on all cattle, and the increased wartime demand for beef resulted in a greatly accelerated movement of cattle across the border in the first 6 months of 1943. Some even came from the central states which normally supply Mexico City. In an effort to slow down this movement the Mexican Government in June 1943 imposed an export quota of 500,000 head for that calendar year. This quantity, however, is not greatly different from normal exports, the 1938–42 annual average being about 465,000 head. An announcement from Mexico City on December 25, 1943, stated that the quota of 500,000 would again apply in 1944.

Production for Domestic Use

Cattle for Mexico's domestic market are produced on a wide variety of farms and ranches, by people living in towns and villages, and by "*ejidos*," which in Mexico are agrarian communities each consisting of 20 or more individuals to whom the Government has given limited ownership of land.

This animal is typical of the kind slaughtered for consumption in the larger cities of Mexico.

On most of the ranches in the central, southern, and coastal regions the cattle are raised and fattened on the same ranch. This is not true in the Huasteca area, where pasture is more abundant than in any other part of Mexico. On the better land of this area only 1 to 1½ acres are required per cow. A common practice is to purchase 2- to 4-year-old cattle in other areas and bring them to this rich pasture for fattening for a period of 6 months to a year.

About 25 percent of Mexico's cattle are produced on *ejidos* and are mostly of the so-called *corriente* (common) or *criollo* (native) type. Some progress is being made to breed these cattle up by the use of Brahma bulls. At the present time the *Nueva Italia Ejido*, one of the larger *ejidos* in Mexico, uses 20 purebred Brahma bulls because this breed is more resistant to the fever tick than other breeds.

The *Nueva Italia Ejido* consists of 80,000 acres, of which 25,000 are under irrigation and 7,000 under nonirrigated cultivation, about 30,000 acres are level pasture land, and 18,000 acres are mountainous range. There are about 10,000 head of cattle on this *ejido*.

A herd of *ejido*-owned *criollo* cattle in the State of México.

The bull calves are not castrated until 2 or 3 years of age and there is little vaccination except for blackleg.

Ranch owners who receive "certificates of inaffectibility" are obligated among other things to pay a tax amounting to 2 percent of each year's calf crop, payment to be made in bull calves. These certificates guarantee the ranchers freedom from expropriation of their lands for a period of 25 years. The Government distributes these calves among the *ejidos* in an effort toward breed improvement.

Some of the cattle from the large *ejidos* are taken to slaughterhouses in the State of Michoacán, but a large portion of them are bought for consumption in Mexico City. Cattle on smaller tracts of land and those raised by people living in towns and villages are primarily for dairy purposes but they eventually go to the slaughterhouse. On some of the *ejidos* the same cattle are used for work, milk, and finally for beef purposes. Only a few animals are kept for the production of prime beef.

Most of the cattle marketed in Mexico City are transported by rail. Recently, however, the railroads have had more than they could handle, requiring more cattle to be driven to Mexico City on foot, some from as far off as the Huasteca area, a distance of around 150 miles. Truck transportation is used but little. Many of the larger ranchers bring their own cattle to market, slaughter them, and sell directly to meat shops. Another common means of getting meat to the consumer is for buyers to go out in the country and buy from ranchers for the larger markets.

Each political division of Mexico has its health department. In the Federal District the health department maintains at the slaughterhouses inspectors who usually are graduates of the veterinary school of the University of Mexico. Inspectors are also maintained at meat shops and markets where the meat is sold. The lack of preservation of meat through refrigeration is a major problem and one that needs consideration. There is a refrigeration plant at the general slaughterhouse in the Federal District but it is not used entirely for meat.

The future of the Mexican cattle industry looks bright. Prices for livestock are at a high level and demand is brisk. Livestock men are aware of these circumstances and they also realize that to make the best of them better breeding, feeding, and management practices are essential. The past 4 or 5 years have been relatively profitable ones for Mexican cattlemen and many of them are now financially able to effect improvements. Progress along this line, however, has been retarded because of war-created shortages of critical materials, such as barbed wire for fencing and equipment for better watering systems.

There seems to be general agreement that more fencing

(Continued on page 116)

Toward Practical Cooperation

During the past few years several groups of young Latin Americans have taken agricultural training in the United States as a part of a program for inter-American cooperation. This article tells about the group that trained under the USDA's Bureau of Agricultural Economics.

by CARL F. TAEUSCH

They began coming in October 1942, these genial representatives of the other American Republics, and they kept coming until February 1943, when a total of 19 had arrived. They came at the invitation of the U. S. Government to study Agricultural Economics for approximately a year. The Office of the Coordinator of Inter-American Affairs made the initial arrangements, in cooperation with the Department of State. The actual training was supervised by the Bureau of Agricultural Economics of the U. S. Department of Agriculture.

All the "Trainees" were college graduates, generally of universities of their own countries, or had an equivalent educational background. Most of them, in addition, had 2 or more years of public or private administrative experience in agriculture. Selection of these 18 men and 1 woman had been carefully made, in cooperation with the various republics, but it was generally agreed by the Department staff that their capacities exceeded even our optimistic expectations.

The primary purpose in having these trainees come to the United States was to promote friendly relations among the Americas and, so far as this group was concerned, to give fuller meaning to inter-American cooperation in agriculture. Since completing the prescribed period of training they have returned to their own countries with a better understanding, we believe, of agriculture and agricultural policy in the United States and of how they may be beneficially combined with those of their native countries.

Training Adapted to Trainee

The absence of detailed specifications as to procedure permitted each trainee to be treated as an individual and to plan his work in accordance with his previous training, his aptitudes, and his desires. Moreover, every effort was made to let each trainee specialize in the field of work he was to do after he returned home. The major purpose of the program was to fit the trainees for useful work in their native countries, in friendly cooperation among all the Americas.

It soon became apparent that the work for which these trainees wished to fit themselves, and which they aspired to follow upon return to their own countries, was of a more general administrative character than that of any single division or agency of the U. S. Government. Their prospective functions were department-wide and required acquaintance with many diverse agricultural activities. This does not imply that the interests of the trainees were not well formulated; they were, rather, highly diverse. Therefore, the training program for the group could not be kept within the narrower confines of what might be regarded here as typical specialized graduate work.

Four of the trainees, for example, indicated an interest in farm credit. They were given preliminary intensive training by the staffs of the Division of Farm Finance, Bureau of Agricultural Economics, and of the Farm Credit Administration. Then they went to Baltimore to study the field records of the region, which included reports from Puerto Rico in Spanish. Later they spent a month or so in the Kansas City office of the Farm Credit Administration. Another phase of their training included field work, in cooperation with the Farm Security Administration office at Little Rock, Ark. Then Señor Fernández, of Mexico, went to Texas to study large-scale ranching operations, for use in connection with the courses he is now teaching in the University of Mexico; Señor Ferragut, of Cuba, studied sugar culture, processing, and marketing, in Louisiana, to help him in his present work with the Agricultural Emergency Bureau of the Cuban Department of Agriculture; Señor Burbano, of Ecuador, went to the Southwest, to study agricultural methods of the Indians, and to Amarillo to study dry-farming methods, to enable him better to function in his present capacity as Head of the Bureau of Agricultural Economics in Ecuador. Señor Aquino, of El Salvador, also went to the Southwest and to the irrigated areas of California. Señor Aquino is remaining here another year with the National Planning Association to study data and literature on Central America available in the United States. He will then resume his post in the Banco Hipotecario in El Salvador.

Two of the trainees were interested in farm-management and cost-accounting methods. They worked chiefly with the Division of Farm Management and Costs, but also studied the field work in the Bureau

---

The author is Head of the Division of Programs Study and Discussion in the USDA's Bureau of Agricultural Economics and is Director of the Latin American training program within that Bureau.

offices at Milwaukee, Wisconsin, and Lincoln, Nebraska. Señor Ahumada, of Chile, is now at Harvard, where he has a Littauer Fellowship in Public Administration; he will return to Chile soon to continue his work with Chile's Bureau of Agricultural Economics. Señor Alcazar, of Bolivia, after completing his training work in Washington, D. C., went to Iowa State College for a half-year's graduate work, and is now at Harvard, studying Economics and Administration. He too will return to his own country to head up the relatively new Bureau of Agricultural Economics.

Señores Pelayo, of Argentina, and Graña, of Uruguay, came with a background of experience in the bureaus of statistics of their respective governments. They worked chiefly with the Division of Agricultural Statistics and then took an extensive trip throughout the country, visiting the various field offices of the Bureau and types of farming areas similar to those of their own countries. They combined happily the policy and technical phases of statistical analysis. Both have returned to their own countries, Señor Graña to head the newly formed Bureau of Agricultural Statistics, and Señor Pelayo to reassume a responsible post with the Bureau of Statistics.

A number of the trainees worked here on individual programs. Señor Santaella, of Venezuela, for instance, was interested especially in agricultural price structures: he also traveled through the South and West, studying the cattle industry and dry-land farming. He has returned to Venezuela to assume a post in the recently created Ministry of Foreign Trade—after declining an offer to remain in the United States another year to work with the Inter-American Bureau of Statistics.

Señor Arellana, of Honduras, was especially interested in soil analysis and the adaptation of crop patterns and timing to the types of soils to be found in the Caribbean area, especially in relation to the rainy seasons. He discussed these problems with soils experts at the Universities of Minnesota, Wisconsin, Iowa, Nebraska, and Indiana. After completing a survey of agricultural resources in Central America, under the auspices of the Institute of Inter-American Affairs, he is now studying Public Administration and Economics at Harvard University.

Señor MacLean, of Peru, came here to study agricultural cooperatives. He visited a considerable number of the main cooperative offices throughout the country, and particularly with specialists at Cornell University. He has returned to his own country to head the newly established Bureau of Cooperatives.

Señorita Hooper, of Panama, came to study Extension methods and Farm Security practices. She got into the field quite early and spent most of the year, first in Arkansas and Louisiana, and later in New Mexico and Arizona. She returned to Panama to work among the

All of the trainees, most of whom are pictured here, won many friends for themselves and for their countries while here in the United States.

small farmers in an effort to encourage them to raise more chickens and to improve standards of nutrition for children. This promises to be an outstanding pioneer venture.

Señor Cruz, of Costa Rica, came to study agricultural administration in general, to broaden his knowledge for work in his position as Under Secretary of Agriculture. Although he spent most of his time with the various agricultural agencies in Washington, he visited a number of the State experiment stations, including those at Cornell and in New Jersey, Maryland, North Carolina, and Florida.

Monsieur Baker came from Haiti, where he was connected with the Haitian Department of Agriculture. His interests were chiefly in determining methods of utilizing local agricultural products in small industries for home consumption—soap, cotton cloth, fabricated houses, etc. He visited the laboratories and field operations at Tuskegee, Texas A & M College, and Berea College. He returned to his own country to head the agency dealing with the migration of peoples and their education.

Senhor de Moura, of Brazil, studied chiefly methods of inspecting and packaging of fruits and vegetables for export. He visited the markets at Chicago and New York and has returned to his official post in Rio de Janeiro.

Señor Ferrario, of Paraguay, came to study the sugar and cotton markets. He visited those at New York and New Orleans, as well as a number of cotton mills in Alabama, Georgia, and the Carolinas.

Three of the trainees chose to study the problem of reintroducing the rubber tree into the Americas. Toward this end Señores Herrera, of the Dominican Republic, Sierra, of Guatemala, and Barquero, of Nicaragua, worked at the Beltsville laboratories and then at the Turrialba station in Costa Rica.

A Trip to Our Southwest Country

A considerable number of the trainees visited the Southwest to learn methods of education among the Hispaños and Indians of that area and in a type of farming area similar to their own. A supplementary appropriation from the Coordinator's Office also permitted five additional trainees, Latin American educators from countries with a preponderant Indian population, to visit this Southwest part of the United States. They were Señores Serna, from Mexico, Morales, from Guatemala, García, from Peru, Bairón, from Bolivia, and Murgueytio, from Ecuador. These men worked under the supervision of the Office of Indian Affairs, largely in the Arizona-New Mexico area, but they also visited the Chicago and Washington offices and Indian reservations in various other parts of the country. These five men have returned to their own countries to continue work in their respective Ministries of Education.

One phase of the trainee program was a study and analysis of agricultural records. Pictured here, from left to right, are Jorge Ahumada of Chile, Roberto Arellano of Honduras, and Jorge Alcazar of Bolivia.

The work of the trainees who went to the Southwestern States was highly significant. Naturally, it is this southwestern, or Hispanic, section of the United States with which these Latin Americans feel their closest ties. Here is common ground for interpreting the Good Neighbor Policy. In the United States there is a Spanish-speaking population of some 3 million; the Southwest is the home of many of these people, most of whom stem from families that have lived there longer than have those of the Anglo stocks. Hence, the interest of the trainees in the agricultural problems, policies, and methods of the Southwest.

Inter-American Atmosphere

The narration of such factual matters is an inadequate method of conveying to the reader the more personal touches which these people brought from their native lands. Each of them stood out as an individual. They soon became known by such characterizing nicknames as "Spivis," "the ball of fire," the "Don Juan," and "Joe Carrioca." Fired with the zeal to return to their own countries to improve the lot of their farm people, they worked hard to achieve their purpose in coming here—but not so hard as to prevent them from occasionally accepting invitations to locally sponsored social functions.

There were the difficulties of being separated from home and family for so long, and the emotions of hearing good or bad news from home. Some brought their wives and children with them. For them especially there was the ever-present problem of making the wisest possible use of their funds in a country where prices were high and rising. There were troubles with streetcar fares and telephones, and with the cold winter winds—some had never seen snow before. But all showed a genial and earnest spirit that won many friends for them and for

(Continued on page 112)

Naranjillas—

The Golden Fruit of the Andes

by MANUEL EDUARDO R. CHALONS

Ecuador is a land of strange contrasts, where one can find within small geographic limits, sometimes on the same farm, such widely differing crops as cacao and apple trees, wheat and sugarcane. We also find here the paradox of a tropical plant that thrives at high altitudes. Since this plant grows almost exclusively in Ecuador, the botanists have quite properly named it after the capital of the Republic. I refer to the *naranjilla*, *Solanum quitensis*, the Andean fruit of super qualities.

Without a doubt the *naranjilla* can be classified as one of the principal sources of fruit juices and drinks. At the present time, however, the people of Ecuador are about the only ones who can have this delicious juice for breakfast or taste its tangy flavor in pie or marmalade. Although *naranjilla* juice made its debut to thousands at the New York World's Fair a few years ago, transportation and other difficulties have prevented this fruit and its products from receiving the widespread popularity they deserve.

The *naranjilla* belongs to the *Solanaceae* plant family, a typical American family that has given the world many other food products such as the potato, tobacco, eggplant, and tomato, and it closely resembles the tomato in its inside pulp and seed. This fruit really should have been called "*tomatilla*" because it is more like the tomato than the orange but the natives, more practical than scientific, named it the "little orange," due, no doubt, to its abundant and delicious juice and golden color.

The plant is an herbaceous bush, not over 8 feet high, with an abundance of big leaves, some of which grow to be 18 inches long. On the upper side the leaves are dark green, while underneath they are light green with scattered violet spots. The small white flowers are distributed profusely in corymbs in the axils of the leaves. The fruit is round, about 2 inches in diameter, and of bright orange color when ripe. The fruit, as well as the leaves and branches, is covered with a soft white fuzz that is lost during harvest and packing.

Harvest is Continuous

In the middle-altitude valleys of the *naranjilla* country the harvest is a year-round weekly event. In the Baños region, for example, each Tuesday finds the groves along the sloping hillsides of the rain forest agog with activity as the men and women of the plantations bring to the center of the grove their sacks of fruit. Here the fruit is sorted and packed with grass in boxes and large bags for the mule ride to market. Early Wednesday morning the *naranjilla*-laden burros converge on the muddy trails to form a long train that keeps the suspension bridges resounding and swaying with their clatter until 10 o'clock or so. As soon as this weekly harvest is piled high at the roadside market place, buyers from Quito, Guayaquil, and Ambato barter with the owners to establish a price, which, in all probability, will be different the following week.

Requirements for Production

In growth the *naranjilla* has special habits and requirements. Although it needs a tropical climate, it is not found outside the area of the Andean cordillera at altitudes ranging from 4,000 to 7,000 feet. In spite of the fact that tropical conditions prevail in places all along the cordillera from Colombia to Peru, and there are some plants in these places, the best development is

Naranjilla plants are not over 8 feet high and bear fruit continuously from 14 to 24 months.

The author is an outstanding authority on Ecuadoran agriculture and at the present time is Director of the Division of Agricultural Economics in Ecuador's Ministry of Agriculture.

Early in the morning the suspension bridges resound with the clatter of naranjillas being carried to market.

between the limits of latitude 2° N and 5° S., which includes practically all the Ecuadoran Andes.

Naranjillas are grown on well-drained slopes, usually on newly cleared land. Seedlings are transplanted to the field as soon as they are strong enough, after which there is little work to do in the *naranjilla* grove until some 14 months later, when harvest begins. The plants are spaced about 730 to the acre, and during the 14- to 24-month bearing period each acre will yield from 180 to 360 bags of fruit weighing 125 pounds each. Throughout this bearing period the plants are covered with fruit in various stages of maturity. Unfortunately, when the fruit-bearing period is over, the land is too poor for any crop other than sugarcane, bananas, or pasture.

In the northern section of Ecuador *naranjillas* are found on the western slopes of the Andes in the vicinity of Nanegal, Calacali, and Gualea. A rich producing area is found on the other side of the cordillera near Baeza, but here the fruit is different in that it is sweeter and has less juice. The most productive area in all Ecuador is to the south in the Baños region. *Naranjilla* groves are spotted on the slopes of the beautiful Pastaza River Valley and grow all along the road which follows this river as it rushes through the Oriente, or eastern part of Ecuador, to its rendezvous with the Amazon. Still farther south this remarkable fruit is found in the valleys of Yunguilla in Azuay Province and in the valley of Guangocolla in the Province of Loja.

Used Chiefly as a Fruit Drink

Naranjillas are consumed principally as a drink. They have an abundance of juice that is rich in pepsin and albumen and makes a delicious foamy drink when sugared and stirred. The juice is also rich in proteins and minerals, sometimes having 1.5 percent proteins, with a lime, phosphate, and magnesium content from .98 to 1.6 percent of the total juice. *Naranjilla* marmalade is packed for the commercial market by a firm in Quito, and *naranjilla* pie is the choicest treat a hostess can serve to her guests. The flavor of this fruit is sweet, yet it has a tartness reminiscent of orange, pineapple, and tomato combined and a fragrance that is refreshingly distinctive.

Reasons for Limited Popularity

The question might logically be asked: Why is it that such an exceptional fruit is not well known outside the area in which it is grown?

One reason why the *naranjilla* has not been successfully introduced into other areas interested in growing it is its strict requirements of soil, temperature, rainfall, and altitude. Plants carefully grown in California and Florida have produced abundant leaves and some flowers but there is no record of any of the fruit being produced in these new environments.

Another reason why this fruit has not become more popular is the fact that it is difficult to transport any great distance. It does not keep well under ordinary shipping conditions, and the extra cost of refrigeration tends to make transportation charges so high that the average consumer cannot afford to buy it. Although shipment of *naranjilla* juice in a preserved form seems to be the most promising method of transportation to distant markets, this has not proved satisfactory. When the juice is pasteurized or treated with anti-fermenting

Naranjillas are used in various ways. Here Rosita Pena proudly displays naranjilla pie, juice, marmalade, and some of the raw fruit.

agents, the fragrance is destroyed, leaving an insipid and colorless liquid. Progress is being made, however, to overcome this difficulty.

In 1939 an Ecuadoran firm succeeded in sending some 1,500 gallons of *naranjilla* juice to the World's Fair in New York, where it was enthusiastically accepted. There were reasons to believe that this relatively unknown but remarkable fruit would in due time become the favorite of millions of North Americans. Transportation difficulties, as already mentioned, and the high customs duties of the time, however, did not make feasible the development of an export business in this product in spite of the keen interest shown by several North American fruit-juice and extract companies.

Consumption of the fruit is now limited to Ecuador, and production is naturally in proportion to this demand. Estimates are that about 2,000 tons of *naranjillas* are produced annually, two-thirds of which are grown in the Baños region. The largest group of consumers is in Guayaquil, and here is where most of the crop is sold.

The possibilities for increasing the production of this crop are great when consideration is given to the fact that the production of 2,000 tons requires not more than 100 hectares (about 247 acres) of land. Extensive areas other than those now in production are adapted to cultivation of the crop. The plant is an easy one to grow since it matures rapidly, producing fruit in a little more than a year. No special care is required between planting and harvest other than two or three cleaning and weeding operations during its 3-year life.

The hope is very much alive that further development of methods for preserving foods will make it possible for this real American fruit to reach the important place it deserves among the fruits of our continent.

The naranjilla harvest is piled by the road where owners and prospective buyers set the current price.

TOWARD PRACTICAL COOPERATION

(Continued from page 109)

their countries, here in the Department and throughout those parts of the United States to which their trips took them. In the course of these trips, the trainees were impressed by the facilities for study and observation provided for them, not only by officials but also by private citizens.

Continued Exchange of Information

Prior to returning to their own countries, these trainees assembled statistical and other materials to carry back with them. They also arranged to have current materials sent them as issued. Arrangements were made for an exchange of their own materials—information regarding complementary crop production and possibilities of increasing trade—which will be of great mutual benefit to all the Americas. The development of further sources of information in their own countries will, in all probability, be stimulated by these men as a result of the year's study in this country and with fellow students from neighboring republics.

Most of the trainees left this country with regret—ours as well as theirs. The hope prevails that other representative young men and women from the Latin American countries may be enabled to study agriculture in the United States toward a better understanding of hemispherical problems. Similarly, United States agriculturists and students who go to neighboring republics obtain information toward sounder inter-American cooperation in agriculture. By working in daily contact with these alert students from South of the Border, it soon became apparent that they have as much to contribute and to offer to us in the way of information and ideas as we have to them.

Those who have completed their work and gone home have maintained a friendly correspondence. They are kept informed of the current addresses of each member of the group, and friendships formed here among them are being continued. "*Saludos Amigos*" seems best to express the spirit of the situation, and they all left with that hopeful phrase on their lips, "*Hasta la vista!*" Surely, the warm qualities of the phrase "Friendly Neighbor Policy" have become impressed in the minds of those of us who had the pleasure and privilege of working with Jorge and Francisco, Roberto, Edouard, and Joaquín, Jaime, Luis, and João, Ramón and Casto, Roberto, Rafael and Ofelia, Alejandro, Juan and Héctor, Max and Reinaldo, Simón, Julio and Augusto.

●

Unlike North America, Latin American countries have few lakes, the largest being Lake Titicaca. This lies about two and one-half miles above sea level, is navigable, and has an area of several thousand square miles.

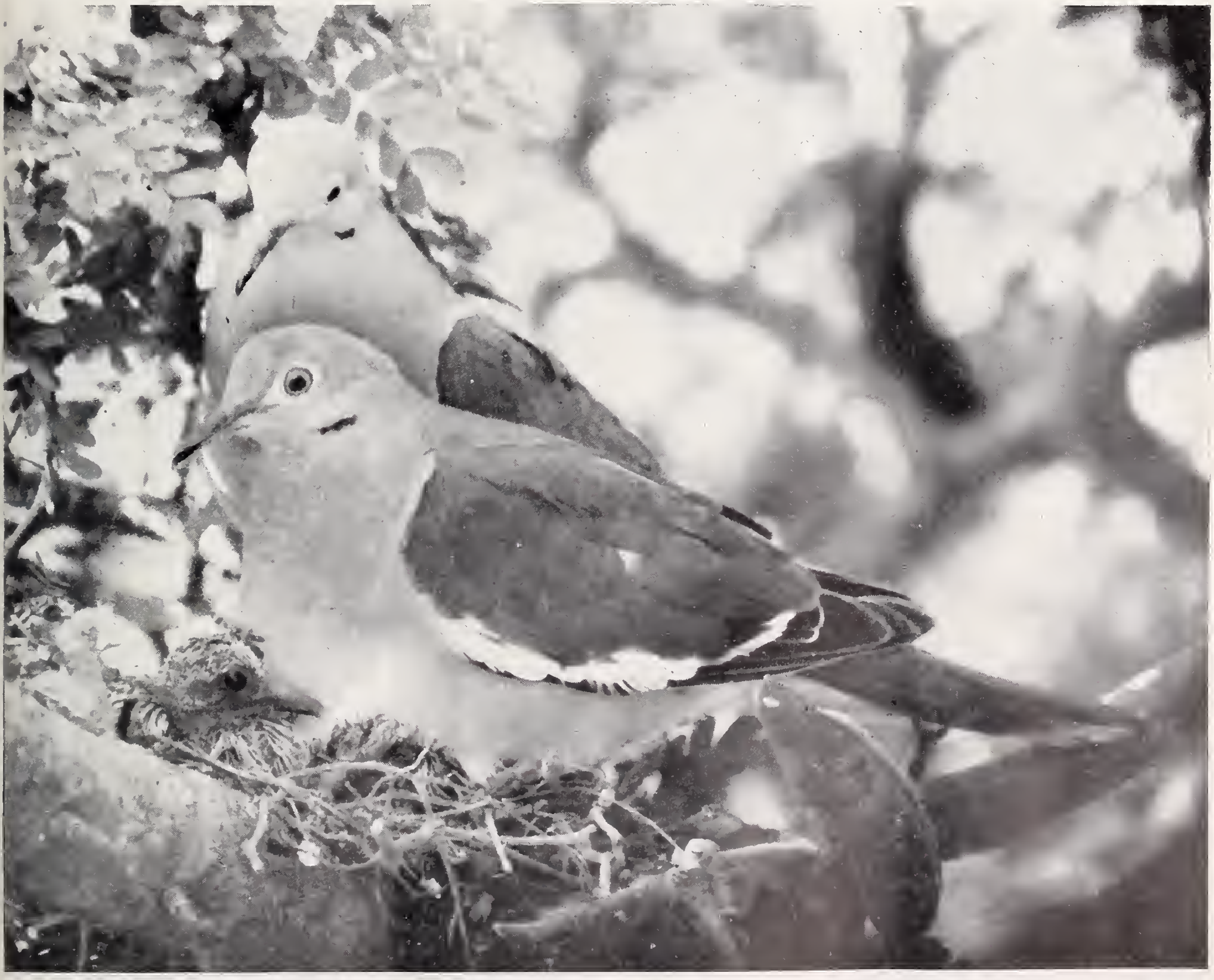
The White-winged Dove of the Americas

by GEORGE B. SAUNDERS

The handsome white-winged dove has been called the successor to the passenger pigeon. Although its numbers are very small in contrast to the one-time millions of passenger pigeons, yet in the Lower Río Grande Valley of Texas during autumn months, the spectacular mass flights of tens of thousands of these doves thrill all who witness them. In the nesting season its habit of forming colonies in the dense ebony woodland is also reminiscent of the now extinct passenger pigeon.

Esteemed by epicures as a highly desirable bird for the table, the white-winged dove ranks high among sportsmen of many countries from the southwestern United States to the northern part of Panama. This dove is hunted also in Cuba, Haiti, the Dominican Republic, and in other areas of the Caribbean. Its importance as a game bird is indicated by the fact that in 1942, during a hunting season of a few days in the Río Grande Valley of Texas, between 125,000 and 150,000 were taken by hunters.

Recent biological investigations of the white-winged dove have been made by the U. S. Fish and Wildlife Service and by State game agencies of Texas and



This white-wing nest is fixed to the crotch of a Texas ebony and is made of twigs from that tree. The parents of the nestlings take turns at carrying out domestic responsibilities.

Arizona, primarily to determine the causes for the great decrease in its numbers in those States and to ascertain whether a restoration program would be practicable. Findings indicate that an optimum population probably can be maintained by continued stringent hunting regulations.

On March 15, 1937, Mexico ratified the "Convention Between the United States of America and the United Mexican States for the Protection of Migratory Birds and Mammals." Having already been ratified by the Senate of the United States. this action brought under Federal protection a number of birds which had not previously enjoyed such a status under the Migratory Bird treaty with Great Britain. Probably the most important game bird on the new list was the white-winged dove.

What happened to the passenger pigeon in eastern North America almost a century ago nearly happened to the white-winged dove in southern Texas during the past two decades, when clearing of woodland, increased hunting, and other changing conditions cut deeply into the ranks of this attractive member of the American fauna.

There are several subspecies or geographic varieties of the white-winged dove. One is restricted to the western coastland of South America, from northern Chile to southwestern Ecuador, the others from Panama northward to the southern United States. Of the latter subspecies the eastern white-winged dove is the most widely distributed, being found in the West Indies, Central America, eastern Mexico, and southern Texas. The western white-winged dove breeds in western Mexico and north to Arizona and western Texas, but winters in western Mexico.

In other parts of its range the eastern white-wing is reported to be non-migratory but, as banding returns have proved, those that breed in eastern Mexico and southern Texas journey each autumn to wintering grounds in Central America. In April the flocks return, following the Pacific coastal plain northward to the Isthmus of Tehuantepec, crossing at or near that natural pass to the Gulf coastal plain, along which they have nesting grounds northward to southern Texas. At the height of migration, as the flocks pass overhead, the observer is again reminded of the stories of passenger pigeon flights of old.

The eye-catching arc of white across the middle of each wing identifies this bird in flight. It is one-fourth again as heavy as the average mourning dove and appears even larger because of its sturdier build. Viewed at close range, the adult white-winged dove is a most pleasing combination of soft grays and browns, accented by the brilliant coral red iris, glossy iridescence on the sides of the neck, contrasting black flight feathers and white wing band, and carmine legs and feet.

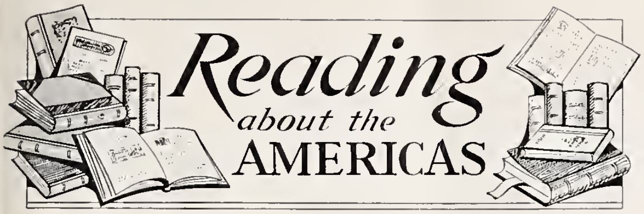
"Who cooks for you?" say those persons who interpret his song in English; "Que triste estoy!" say those who hear it as Spanish. Whatever the translation, most listeners like the musical hooting of these doves.

Although some pairs nest together in colonies, the majority are more widely dispersed over large areas of woodland. The flimsy nest is built by the female of twigs brought to her one at a time by the male. Two cream-colored eggs are laid at each setting and the parents share the duties of incubation, which lasts 2 weeks. The nestlings are fledged at about 2 weeks of age and by the time they are 4 or 5 weeks old they are weaned from parental care and join the adults in flights to food and water. During the nesting season in Texas from one to three or more settings of eggs are laid by each pair, but predators take a heavy toll. Most pairs succeed in raising only one brood of young each season.

In September when the first so-called "northers" sweep across Texas, some white-wing flocks begin their journey southward. By mid-October almost all are on their way to sunny wooded valleys of the Pacific coast in Central America.

"Those overalls are your UNIFORM, bud."
FOOD FOR FREEDOM

Dr. Saunders is a biologist of Migratory Bird Investigations, Fish and Wildlife Service, U. S. Department of the Interior. Photo is by the author.



Reading about the AMERICAS

Dehydration—Its Post-war Future, by Lawrence K. Harper. 132 pp. E. W. Williams Publications, Inc., New York City; 1943. Illus. This is a popular, rather than a technical, presentation of dehydration, covering the brief past of the industry, the problems of manufacturing and marketing, and the possibilities of dehydration in the future. An extensive bibliography on the subject is included, and there are numerous tables listing such information as: The foods dehydrated commercially in eight Latin American countries, Canada, Australia, Egypt, New Zealand, and Turkey; the geographic growing location in the United States of products for dehydration; Government requirements for dehydrated foods for the fiscal year 1943–44; and amounts of various dehydrated vegetables required to produce 1 pound of rehydrated product.

Cultivo del Tabaco en el Valle del Cauca, by Guillermo Ortiz R. 43 pp. Imprenta Departamental.—Cali [Colombia]; 1943. Illus. In Spanish. An informative bulletin, not a technical treatise. The stated purpose of the bulletin is to present clearly and simply the general practices which should be followed in cultivating good tobacco in el Valle del Cauca. Technical expressions and those not of immediate interest to the farmer have been avoided. The author gives types of tobacco, instructions for growing, curing, sorting the tobacco, and the pests and diseases to which the crop is subject.

Las Leguminosas Argentinas, by Arturo Burkart. 590 pp. Acme Agency, Soc. de Resp. Ltda., Bmé. Mitre, 552, Buenos Aires; 1943. Illus. This is a technical Spanish text and reference book on the *Leguminosae,* one of the large botanical families of the Argentine flora. A large proportion of the genera treated are found also in other South American countries, and the author has included all those of Uruguay and a large part of those of southern Brazil, Paraguay, Bolivia, and Chile. Genera of agricultural interest are treated fully. Keys are included for determining native, adventitious, and cultivated genera and for identifying the seeds of cultivated legumes. The system of classification used is that of P. Taubert in *Die Natürlichen Pflanzenfamilien,* by A. Engler and K. Prantl.

The Amazon, by Caryl P. Haskins. 415 pp. Doubleday, Doran and Company, Inc., Garden City, New York; 1943. Illus. In this volume, characterized as "The life history of a mighty river," the author presents the geologic and natural aspects of the Amazon Valley, its history, the people who have lived there, and its resources—especially rubber. More than half of the book is devoted to a history of the six countries drained by the Amazon—Brazil, Venezuela, Colombia, Ecuador, Peru, and Bolivia—and of their relationships to one another and to the hemisphere.

General Censuses and Vital Statistics in the Americas, U. S. Department of Commerce, Bureau of the Census, and U. S. Library of Congress, Reference Department; Prepared under the supervision of Irene B. Taeuber, Chief, Census Library Project. 151 pp. U. S. Government Printing Office, Washington, D. C.; 1943. An annotated bibliography of the historical censuses and current vital statistics of the 21 American Republics, the American Sections of the British Commonwealth of Nations, the American Colonies of Denmark, France, and the Netherlands, and the American Territories and Possessions of the United States.

La Dietética del Lactante en Quito, by Dr. Estuardo Prado. 73 pp. Publicación del Instituto Nacional de Previsión; Editorial Quito [Ecuador]; 1942. Illus. *The Diet of the Nursing Child in Quito* is a paper in Spanish presented to the third medical congress of Ecuador. It gives conclusions based on observation of 300 cases in Quito, as to: Defects of feeding; infant morbidity and mortality in Quito; and recommended techniques of feeding for a healthy and for a sick child.

Geologia do Brasil, Avelino Ignacio de Oliveira and Othon Henry Leonardos. 813 pp. Ministerio da Agricultura, Rio de Janeiro, Brasil; 1943. This book, in Portuguese, is the gift of two Brazilian scientists to those who are interested in the geology of Brazil but who cannot or do not have the time to examine the entire bibliography on the subject. It is profusely illustrated by maps and pictures.

Federación Nacional de Cafeteros. Informe del gerente al XIII Congreso Nacional de Cafeteros, Junio de 1943. 216 pp. Bogotá, Editorial Antena, S. A.; 1943. This publication contains data on export quotas established under the inter-American coffee agreement; coffee warehousing in Colombia; position of Colombian coffee in Argentina, Chile, and Uruguay; the Pan American Coffee Bureau; and on rural health activities in the coffee districts of Colombia.

Monografía Agrícola de la Provincia de Imbabura. Jaime Burbano and Cristóbol Ruíz P. 118 pp. Ministry of Agriculture, Quito, Ecuador; 1943. A discussion of agricultural problems and possibilities in the Province of Imbabura.

Arts, Crafts, and Customs of Our Neighbor Republics, compiled by Emilie Sandsten Lasalle. 52 pp. Library Service Division of the U. S. Office of Education in cooperation with the Office of the Coordinator of Inter-American Affairs, Washington, D. C.; 1943. This is a bibliography of material on the other Americas—books, pamphlets, and pictures—suitable for various age levels. It contains an outline of arts, crafts, and customs, showing the variety of artistic expression which Latin America offers, and furnishes a list of the addresses of the publishers whose books and materials are mentioned in the bibliography.

Recent Trends in Inter-American Economic Cooperation, prepared under the direction of the Executive Committee on Post-War Problems of the Governing Board of the Pan American Union. 42 pp. Pan American Union, Washington, D. C.; 1943. The principles of inter-American economic relations—both basic principles and emergency agreements—are stated, and the application of those principles through the various agencies for economic cooperation is explained, under the headings of commercial treaty relationships, financial, agricultural, mineral, and industrial cooperation, transportation, and public health and sanitation.

Revista de Direito Agrário. Vol. 1, No. 1. 44 pp. Rio de Janeiro, Brazil. In addition to many statutes and decree laws, this volume contains articles on sugar, said to be the most important industry of Colonial Brazil, and on the reform of sugarcane cultivation brought about by the Brazilian Constitution of 1937. A summary in English is given at the end of each article.

Pan American Economics, Paul R. Olson and C. Addison Hickman. 479 pp. John Wiley and Sons, Inc., New York; 1943. The book covers the foreign trade, investments, reciprocal trade agreements, and exchange and other controls of Latin America. It has also a chapter on the outlook for future economic cooperation in the Americas.

The Agricultural Cooperative Movement in Peru, by Alejandro MacLean y Estenós. 16 pp. (mimeographed); Pan American Union, Washington, D. C.; 1943. Deals with various types of Peruvian cooperatives, from pre-Hispanic times.

Price control in the Republic of Colombia, Foreign Information Branch, Division of Research. 60 pp. (mimeographed). Office of Price Administration, Washington, D. C.; 1943. A memorandum outlining the price control program in Colombia.

El Problema Económico de Cuba, Rogelio Casás Cadilla. 45 pp. Compañia Editora de Libros y Folletos, Habana, Cuba; 1943. A discussion of social reform, absenteeism, and future plans.

Outline History of Latin America, A. Curtis Wilgus and Paul d'Eça. 420 pp. Barnes and Noble, New York; 1943. This is a revised (third) edition of a standard text. It includes maps and bibliographies.

MEXICO'S CATTLE INDUSTRY

(Continued from page 106)

is needed to facilitate controlled breeding, to prevent cattle from straying on the highways, and to lessen mortality caused by cattle grazing on poisonous plants. Watering systems need to be developed, particularly in the northern part of the country where drought is an annual hazard. Breed improvement is another positive means of developing Mexico's cattle industry. A large proportion of the cattle are now grade stock, and many cattlemen believe they could profit by instituting herd-improvement programs. In this connection, however, the principal need is to find types of beef cattle that are adapted to each area.

A number of new slaughterhouses are being built in Mexico and some of the old ones are being reconstructed.

There are indications that efforts are being made both by the Mexican Government and individuals to overcome these difficulties. Much progress has already been made in disease control and an efficient corps of veterinarians is working to make such control even more effective. Breed and pasture improvement is a long-time project but is receiving attention. All of these improvements, combined with a more efficient organization of the domestic market, point to a bright future for the Mexican cattle industry.

●

Once there was a Central American Union, to which Honduras, Guatemala, El Salvador, Nicaragua, and Costa Rica all belonged. This was before there was any Republic of Panama. The five stars on the flag of Honduras represent the five states of that union.

●

The highest mountain in the Americas is Aconcagua on the Argentine-Chilean frontier. It is 23,000 feet high.

●

Panama is the youngest American Republic. It became independent of Colombia in 1903.

Editor's Note.—The listing of publications here does not necessarily imply an endorsement of them by the Department. For copies of private publications, write direct to the publishing agency given in each case.

ALONG THE *Agricultural Front*

▲Cuba Creates Fishing School and Marine Institute

Following the general recommendations of the United States Commission, which a little more than a year ago studied the fishing industry in the Caribbean area, the Cuban Government, through its Ministry of Agriculture, has issued two decrees, one authorizing the establishment of a School for Fishermen, the other a Marine Institute.

The fishing school will be established in the town of Surgidero de Batabano and its purpose will be to train personnel in the field of fishing and related industries. A 2-year course will be offered, the first year of which is to be devoted to general education and a course in the different fishing arts. The second year will include the more technical aspects of fishing, such as physical and fishery geography, fish biology and methods of fishing on the high seas, navigation, marine carpentry, packing fish and shellfish, fishing laws and accounting, and operation of internal combustion engines.

The Marine Institute (*Instituto del Mar*) is to be an organization of a technical and advisory capacity attached to the Ministry of Agriculture. It will be located in the *Castillo de la Punta* in Habana and its various sections will include: Oceanographic Museum, Library, Oceanographic Station, Biological Station, Instruction, Industrial Experimentation, and Publications. The stated purpose of the Institute is to investigate marine wealth, develop the fishing industry, and make plans for a National aquarium.

▲Cottonseed Distributed to Farmers in Paraná, Brazil

During the 1943–44 season farmers in the State of Paraná, Brazil, purchased 810,945 kilos (1,787,810 pounds) of cottonseed from the State seed distributing agency, according to a report from Brazil's Ministry of Agriculture. This quantity is sufficient to plant about 121,644 acres and is nearly twice as much as the amount distributed the previous year. The quantity of seed distributed has increased appreciably each year since 1938, with the exception of 1941, when a mild drought reduced the area planted.

The system for distributing cottonseed in Paraná, like that of the State of São Paulo, is for the seeds to be developed at one of the State experiment stations, increased on farms of cooperating growers, delinted, fumigated, and sacked by the Government agencies, and sold to farmers at cost.

▲Jute Cultivation in Colombia and Argentina

The Colombian and Argentine Governments have each recently become interested in expanded cultivation of jute, according to press reports. Experimental plantings of seeds brought from India have proved satisfactory in Colombia and may become the nucleus of further cultivation. In Argentina the cultivation of this commodity is to be under strict control, and a fund of 300,000 pesos (approximately $87,000) has been established to finance experiments that have thus far proved quite successful.

▲Wine Industry Important in Rio Grande do Sul

The wine industry of the State of Rio Grande do Sul, Brazil, is the source of livelihood for 20,000 families in the State and directly or indirectly benefits over 100,000 citizens, according to the Brazilian Government Trade Bureau. The value of annual production in the State has been averaging slightly more than a million dollars, and represents 80 percent of the wine produced in Brazil, the Bureau points out. The wine industry in Rio Grande do Sul was started by a group of Italians who migrated to Brazil in the latter part of the last century.

▲Inter-American Workshop Opens at Denver This Month

The University of Denver will hold an Inter-American Education Workshop this summer from June 19 to July 21, providing an opportunity for the study of instructional techniques and materials requisite for teaching in the field of inter-American affairs. The project will be sponsored jointly by the University of Denver and the Office of the Coordinator of Inter-American Affairs.

An announcement about the Workshop further points out that special instruction will be offered for librarians who wish to do inter-American work in this country or in Latin America, or for Latin Americans who wish to establish schools of librarianship in their own countries. About twenty scholoarships, covering tuition and a part of expenses, will be available to qualified persons who are concerned with inter-American education. Further information about this Workshop project can be obtained by writing to Dr. Wilhelmina Hill, University of Denver, Denver, Colorado.

▲Chile Desires to Expand Its Fishing Industry

An exposition designed to promote fishing and related industries was held from March 10 to 12 at San Vicente, one of the principal fishing ports of Chile. The exposition was sponsored by the municipal government of Talcahuano with the help of a 100,000-peso grant ($5,160) from the Chilean National Government. Among the products exhibited were canned and dried fish, sardines in oil and in oil and tomato sauce, fillet of anchovy in oil, tuna in oil, articles manufactured from fish skins, and items of fishing equipment. A feature of the exposition was the launching of a 12-ton fishing boat, several of which were completed in San Vicente during the past year.

Other steps taken recently to promote Chile's fishing industry have included the allotment of funds for installing refrigeration in fishing ports, construction of refrigerator cars to facilitate transportation of fresh fish, and compulsory use of fish by Government agencies that serve meals. An extensive educational campaign has also been undertaken to popularize fish as a nutritive food.

▲Cuban Agriculture Diversified in 1943

The Cuban Government's desire to diversify agriculture was at least partially fulfilled last year, according to a recent report on Cuban agriculture for the past year. A relatively small sugar crop, higher prices for other products, and a shortage of certain usually imported products, such as rice, beans, potatoes, onions, vegetable oils, cured pork, and dried fish, helped the Government's program to widen the range of domestic production.

Agricultural policy, the report explains, was centered on diversification, price control, and improvement in the position of labor and small farmers. As in other years the Government distributed farm seed on a loan basis and garden seed free, distributed information encouraging diversification, supported prices of farm produce at a level designed to increase production without materially increasing the cost of living, and continued in force a decree requiring that a specified percentage of the land be devoted to food crops other than sugar. During the year the Ministry of Agriculture, together with the *Comisión de Fomento*, acquired new farm machinery and planned refrigerated warehouses for storing certain perishable crops.

In addition to giving production data on agricultural production in general, the report points out that in 1943 Cuba became one of the most important producers of luffa sponges, a strategic material formerly imported by the United States from the Far East for marine engine oil filters.

▲Campaign Against Scab Under Way in Argentina

Under a decree recently issued by the Argentine Government the Ministry of Agriculture of that country will conduct an active campaign against sheep and goat scab. Authority is given to intensify the fight against this parasitic disease by preventing the transit of infected animals and by applying immediate treatment to those found to be infected.

The Ministry of Agriculture, through the General Bureau of Livestock, may intervene in any place and at any time during the disinfecting and cleaning of farms which are infected with scab. It will be compulsory for any farm that has temporary or permanent facilities for sheep to be supplied with adequate dipping baths. The decree prescribes penalties for those who fail to comply.

▲Peruvian Co-op Station Gets Additional Funds

The Peruvian Government in its budget for the 1944 calendar year appropriated 1,100,302 soles ($168,126) for continued maintenance and operation of the Peruvian-United States cooperative agricultural experiment station at Tingo María, Peru, according to a recent report. Previously, an appropriation of 1,500,000 soles ($229,200) had been made for construction of permanent buildings.

The Tingo María station has been designated by the Peruvian Government as a central station to plan, control, and interpret work done at the substations located at Iquitos, Río Napo, Río Marañon, Satipo, Marcapata, and Tamopata.

▲Vanilla Vines Get Shade and Support from Cashew Tree

Recent experimental work in Puerto Rico has developed a combination, or partnership, of the vanilla vine and the cashew nut tree that bodes well to help solve a vanilla-production problem. The vanilla-producing plant is a climbing orchid which needs both support and shade for good growth, and the tree that has been used for this purpose in Puerto Rico often loses its leaves in hot dry weather, just when the vanilla most needs shade and protection. In recent test plantings, the vanilla vines have been grown on cashew trees with excellent results.

▲Annual Fair in Panama Shows Agricultural Progress

From the 16th to the 18th of March this year all of Panama's roads led to the city of David in the Province of Chiriquí, where the Fourth Annual Regional Fair was being held. Exhibits consisting of farm products and livestock presented evidence that substantial agricultural progress had been made since last year's fair, which was attended by Vice President Wallace of the United States.

Heading the list of official visitors at the fair this year was Panama's President de la Guardia, who arrived by plane and was greeted by a 21-gun U. S. Military salute. During his 3-day visit to the fair the President presided at the laying of the cornerstone for a modern tourist hotel in David and at the dedication of a site for a permanent Fair building. Hereafter, this fair will be an annual event with assistance from the National Government.

In commenting on the progress that has been made Juan Galindo, Minister of Agriculture and Commerce, said: "The extraordinary agricultural development achieved in the Provinces of Chiriquí and Los Santos is a demonstration of the beneficial effects of well-planned agricultural programs. The important irrigation systems of La Villa River in Los Santos and of Casablanca in Chiriquí may give us an idea of the magnitude of the task carried out by the Ministry of Agriculture during the past 10 months."

▲Cuban Banana Growers Form an Association

At the request of banana planters of Baracoa and Banes, Cuba, an Association of Banana Growers has been organized in which membership of all persons growing or harvesting bananas in these areas is obligatory. Bylaws of the association will be drawn up by a commission of six growers and a delegate from the Cuban Ministry of Agriculture.

AGRICULTURE IN THE AMERICAS STANLEY H. GAINES, EDITOR

A monthly publication of the Office of Foreign Agricultural Relations of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 10 cents per copy, or by subscription at the rate of 75 cents per year, domestic; $1.20 per year, foreign. Postage stamps will not be accepted in payment.

Gifts of the Americas

ORCHIDS

by HALLY H. CONRAD

Orchids, the royal flowers of the forests, grow in all the tropical and temperate regions of the world, but many species popular in the United States for floral displays originated in the Americas south of the Río Grande. The known species of the great family of *Orchidaceae* number about 15,000, the colors and forms of which are too varied to enumerate. The average North American's familiarity with these flowers is, however, limited to the rosy-lilac blossoms that we call "orchid" in color. For weddings, or other special occasions, white orchids are available, and sometimes corsages of greenish-brown varieties complete the costumes of the modishly attired. Only those who have been privileged to visit the Tropics, or some of the great orchid gardens and flower shows of the United States, have any real conception of the infinite variety of shape and hue included in this regal flower family.

In the United States orchids are valued primarily for their blossoms; in England, where interest in them reached its height in the latter part of the nineteenth century, the plants received greater attention. They were collected by the wealthy, and a single rare specimen often brought large sums of money. Orchid hunters risked their lives in remote lands to find new species, and accounts of their adventures in search of the "purple gold" of the forests rival the tales of the early *conquistadores.* Unfortunately, many of the hunters were as ruthless in their greed as the first explorers of the New World. Consequently, the plants were torn from their natural habitats in such large quantities that many lovely varieties have become practically extinct in their original homes. They furnished, however, stock for most of the commercial plants now grown by florists for the cut-flower trade. Colombia and Venezuela gave the *Cattleyas,* which are perhaps the loveliest and best known tropical orchids; Mexico and Guatemala furnished the *Laelias;* Brazil, the *Miltonias;* and most of the tropical countries of the Western Hemisphere contributed *Odontoglossums* and *Oncidiums*—to mention only a few of the known genera. The local names of the flowers are, perhaps, more suggestive to the average person of their attributes—the Dove, the White Sister (the national flower of Guatemala), the Holy Ghost, the Butterfly, the Moth, etc. So ethereal in their beauty were some of these that the Indians brought them to the early churches and planted them on the walls, the roof, or over the shrines of the saints.

By the natives of the other Americas, orchids are generally termed *parasitos,* but they are not parasites. Most of the tropical species are, however, air plants or epiphytes. They fasten their roots upon the bark of trees, or to stone cliffs, and draw their nourishment from water, air, and decaying organic material that collects among their roots. The Temperate Zone species are terrestrial plants, which grow as other vegetation in the soil. The ladyslipper is one of the terrestrial orchids well known in the Western Hemisphere.

First attempts to grow tropical orchids from seeds were unsuccessful, and their culture appeared too costly and tedious to be undertaken by the amateur. As the original sources of plant supplies became depleted by overzealous collectors, however, new discoveries in technique overcame early difficulties. New varieties have been developed through hybridization, and certain of these produce flowers that are considered by some to be more beautiful than those of native species.

An orchid plant does not bloom until from 7 to 10 years of age. Some varieties produce flowers once a year only; others twice a year, especially the hybrids. The blossoms last unusually well—several months on the plant and from 1 to 3 weeks after being cut. Although thousands of seeds may be produced by each bloom, they are scarcely larger than grains of dust. The usual custom at present is to plant them in test tubes containing a kind of jelly. After they germinate, the tiny plants are transferred to other tubes for several months' growth, or until large enough to be placed in small pots of moss, from which they pass to other containers as their growth and development require. The flowers that at last reward man's patience and care represent the highest type of botanical development. Once considered delicate, the orchid is actually unusually strong, having withstood through centuries the vagaries of tropical climates and the onsets of numerous pests that attack it in its jungle home. All this inured it to human handling and hothouse life to make it the pride and joy of the florist.

To those, on the other hand, for whom "the hunt" is more exciting than "the kill," a vast territory, extending from northern Mexico through Central America and parts of northern South America, still offers unexplored regions of promise. In Costa Rica, particularly, exist exciting possibilities for future search. When the war is over, "orchids for Madame" may again arrive in the United States by plane, and species yet undiscovered may be added to the long list for which the world is already indebted to the tropical Americas.

CUBA

Cuba, the "Pearl of the Antilles," lies just 90 miles south of the coast of Florida. This Republic, with an area of 44,164 square miles, is made up of the largest of the West Indian Islands; the Isle of Pines, south of the main island; and numerous smaller bits of land. About half the land area is flat and half mountainous, the Pico Turiquino in Oriente Province rising to an elevation of 8,400 feet. The main island, which extends from east to west, has 2,000 miles of coast line and many good harbors, the most important being Habana, the capital.

Except in the mountainous region where the soils are thin and stony, Cuba's soils are generally fertile, well drained, and suitable for a variety of agricultural products. In 1940 about 16 million acres, a little more than one-half the land area, was in farms.

Climate

The semitropical climate is tempered by the prevailing winds and the ocean. The average annual temperature is about 76° F., with little variation between day and night or from summer to winter. Rainfall averages about 55 inches a year and is distributed fairly evenly over the Island with the heaviest precipitation in the interior.

People

Cuba's original Indian population was soon displaced by Spanish settlers, and the present composition is about one-half white descendants of those Spanish settlers, one-fourth other pure-blood races, and one-fourth mulattoes.

A mestizo, or mixed white and Indian, element did not develop in Cuba. One-sixth of the total population of more than 4 million lives in the capital city, and there are at least 12 cities with more than 60,000 inhabitants each.

Mineral and Forest Resources

Deposits of several minerals exist, the most important ones at present being manganese and copper.

Cuba's forest resources have been depleted greatly during past years and do not now meet domestic needs for lumber. Only about 10 to 15 percent of the total area is in forests and these are located in inaccessible regions. Cedar, mahogany, ebony, and lignum vitae are among the trees that grow well in Cuba and which were formerly exported. The royal palm, so characteristic of Cuba, although not valuable for lumber, does furnish thatch for roofs, and its clusters of small kernels make good feed for hogs.

Agriculture

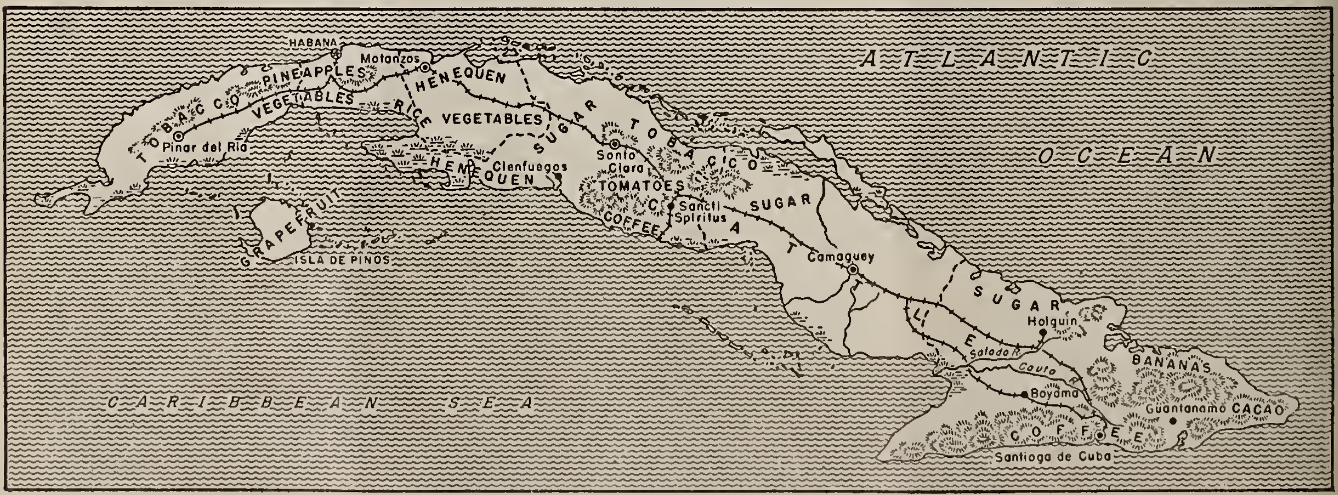
Cuba depends on its agriculture for most of its wealth and for 90 percent of the value of its exports. Sugar is the dominant industry and, with blackstrap molasses, accounts for 80 percent of total export value. Cuba leads in the exportation of both these products, furnishing 20 percent of the sugar entering international trade. Sugar grows over most of the Island but the two eastern Provinces—Camagüey and Oriente—produce from 52 to 57 percent of the total crop.

Tobacco is the second commercial crop, and Cuba's famed Havana leaf is known throughout the world. The finest tobacco, Vuelta Abajo, grows in the extreme western part of the Island, and Remedios, important in exports to the United States, grows in central Cuba. Other important exports are coffee, bananas, pineapples, grapefruit from the Isle of Pines, winter vegetables, and henequen.

Products grown largely for domestic use are corn, rice, beans, peas, yuca, sweetpotatoes, and plantains, which are cooking bananas. Corn and plantains are grown on small farms throughout Cuba in sufficient supply for home use. Rice is the most important grain consumed, but more than three-quarters of the normal consumption ordinarily is imported. About one-fourth of the peas and beans used and all the wheat flour are usually imported.

Increasing production of livestock on the large cattle ranches of east-central Cuba has enabled the country to shift from an importer of meat and dairy products to an exporter of these commodities. Hog production has increased also but does not yet supply all the home market for pork and falls far short of furnishing enough lard, which is imported from the United States.

During the past few years Cuba has been endeavoring to diversify its agriculture and lessen its economic dependence on sugar production. Since Cuba's entry into the war this trend has been intensified and directed toward increasing production of food crops for home use. Experimental plantings of oilseeds and fiber (kenaf or roselle) now being made in cooperation with United States agencies may lead to increased production of these strategic crops.



585630—44 U. S. GOVERNMENT PRINTING OFFICE: 1944

63

Agriculture in the Americas

Issued Monthly by the OFFICE OF FOREIGN AGRICULTURAL RELATIONS
UNITED STATES DEPARTMENT OF AGRICULTURE

LIBRARY
CURRENT [illegible] RECORD
JUL 15 1944
U. S. DEPARTMENT OF AGRICULTURE

IN THIS ISSUE

PAGE
Grasses of Brazil and Venezuela 123
Bamboo 127
In Quest of Quinine 130
Copey Oak in Costa Rica 134
Along the Agricultural Front 137
Gifts of the Americas—Ipecac 139

July 1944

v. 4, no. 7

NAMES & NEWS

Citrus Expert Returns to Mexico

Salvador Sanchez Colin, a Mexican citrus expert, recently completed 4 months of studying the production and marketing of citrus fruits in Florida, California, and Arizona as a guest of the Institute of Inter-American Affairs. While in the United States Señor Sanchez Colin visited leading fruit growers' associations, talked with officials, visited packing houses, and studied fruit-inspection services. In California he spent some time observing the production of essential oils, citric acid, cattle feed, and pectin from citrus fruits. He talked with specialists about new experiments with tropical fruits, such as avacados, papayas, mangoes, and zapotes, all of which are grown in Mexico.

Before returning to Mexico, Señor Sanchez Colin made the statement that, while Mexico has been producing great acreages of oranges for many years, the country has had few marketing regulations. He explained that an immediate problem will be to launch post-war marketing plans and attempt to standardize citrus products. "At present," he said, "Mexico can consume all the fruit she produces. . . . But we want to be careful to avoid overproduction."

◆

Ross E. Moore of the Office of Foreign Agricultural Relations is expected to return soon from an inspection trip of the agricultural experiment stations in Nicaragua and El Salvador, with which countries the U. S. Department of Agriculture has cooperative agreements to carry out complementary crop production programs. The purpose of Dr. Moore's trip was to consult with Nicaraguan and El Salvadoran officials regarding further development of strategic and other crops that will be of mutual benefit to the United States and these Central American countries.

◆

Edward P. McDermott of the Office of Foreign Agricultural Relations has recently been assigned to the Nicaraguan-U. S. Cooperative Agricultural Experiment Station at El Recreo, Nicaragua. His immediate job will be to supervise the construction of necessary buildings for the station. He will then continue as agricultural engineer in the production of tropical crops that are complementary to those of the United States.

◆

Senhor Constantino Ianni has arrived in the United States from Brazil. He will study economics and trade problems at the University of North Carolina at Chapel Hill for approximately a year under a maintenance grant awarded to him by the Department of State.

◆

Doctor João N. de Figueiredo of Brazil, who has been studying practical mining methods at the School of Mines and Metallurgy, University of Minnesota, has been awarded a Specialized and Technical Personnel Grant by the Department of State which enables him to visit certain points in Colorado, Texas, Arizona, New Mexico, Oklahoma, Missouri, and Alabama.

◆

Doctor Andres Soriano of the Columbian Department of Health and the Institute of Hygiene at Bogotá has arrived in the United States as a guest of the Pan American Sanitary Bureau to study for approximately a year the preparation and control of biological products. At the present time he is at the State Department of Health Laboratory at Lansing, Michigan. Later he will spend some time at the State health laboratories in Massachusetts and New York. He is studying under a U. S. Public Health Service fellowship.

Chilean Engineer Applies Training Obtained in U. S.

A leading figure in Chile's broad electrification program, now being developed by the *Corporación de Fomento,* is *Ernesto Ayala* of Santiago, who only a couple of years ago was helping to stake power lines in Mississippi and Arkansas. He is one of some 30 young Latin Americans who worked and studied for a year with the USDA's Rural Electrification Administration.

An honor graduate of the University of Chile,

(Continued on page 138)

Agriculture IN THE *Americas*

Vol. IV • JULY 1944 • *No. 7*

Grasses of Brazil and Venezuela

The grasslands of Brazil and Venezuela are extensive and varied. Many excellent forage varieties exist which, with proper management, could support more and better herds of cattle and also help to prevent water and wind erosion.

by AGNES CHASE

The great grasslands of the world are the Great Plains of North America, the llanos of Venezuela, the campos of central and southern Brazil, the pampas of Uruguay and Argentina, the steppes of Russia and western Asia, the plains of Siberia and adjacent Mongolia and China, the veldt of arid and semiarid south and east Africa, which supports the great game animals made familiar to us by moving pictures, and the steppes and savannas of Australia. None of these exceed the grasslands of Brazil, and none, except possibly Africa, equal them in number of species of grasses.

To people in general, Brazil means the Amazon and Rio de Janeiro. Even tourists rarely see much more of Brazil than the strikingly beautiful country around Rio, or few, at most, penetrate the interior farther than to visit the great city of São Paulo, and perhaps a little of the coffee country. But important as are the coffee lands of the *matta* (country originally forested) of eastern Brazil, the vast interior of open uplands and low tablelands stretching west from the series of broken mountain ranges of the east to Rio Paraguay, and from south of the Amazon jungles to the border of Paraguay and Uruguay, comprises nearly half the country—a country larger than the United States excluding Alaska.

Some of the upland campos are almost pure grassland, but mostly, especially toward the west, they are of the savanna type, with scattered shrubs, or, in Mato Grosso, merge into "*cerrado*," with scattered low wide-topped trees. Along Rio Paraguay stretches the *pantanal*, a vast flood plain with extensive fresh water marshes. *Paspalum fasciculatum*, with thick creeping stems interwoven into a firm mat and with a dense growth of erect leafy stems, covers the alluvium along Rio Paraguay and its tributaries, holding the soil. This land-building grass is the chief factor in changing an area of thousands of square kilometers (1 square kilometer equals .39 square mile) from shallow lakes to marsh, which in turn is taken over by other grasses and by shrubs and eventually converted into dry land. *Paspalum fasciculatum* is to the fresh-water lakes and marshes of the American tropics what the cordgrasses (*Spartina* species) are to like areas in the United States—though some of our cordgrasses endure salt tides, building up land along the low coasts of the Middle Atlantic States.

Much of Tidewater Virginia was built up through the ages by big cordgrass (*Spartina cynosuroides*), its stout rhizomes forming a firm dense network, ever pushing seaward on the shallows of the continental shelf. In the American tropics mangrove trees are the land builders along the seacoast, but from Mexico to Argentina *Paspalum fasciculatum* is the chief soil binder and land builder of fresh-water regions. Along the rivers of the uplands, Ubá (*Gynerium sagittatum*), with stems from 13 to 16 feet tall and long silvery flowering plumes, somewhat like those of sugarcane, and *Panicum rivulare*, a tall coarse grass, form dense colonies and hold the soil in times of flood.

The Influence of Cattle

In a country of abundant grasslands cattle raising is naturally important. During the last 20 or 30 years the

---

The author was an agrostologist in the U. S. Department of Agriculture for 36 years and is now custodian of grasses, U. S. National Museum, Smithsonian Institution. She visited Brazil in 1924-25 and again in 1929–30 to study the grasses there. In 1940 she went to Venezuela at the invitation of that Government's Ministry of Agriculture to study the grasses and report on the forage resources of that country. Mrs. Chase has also visited the principal herbaria in England, France, Italy, Austria, Germany, Netherlands, and Belgium studying the collections of North and South American grasses, described by European authors during the past century and a half. All photos used with this article are by the author.

Some of Brazil's upland campos are almost pure grassland. "Campo limpio" is shown here, with araucarian trees in the background. The location is the State of São Paulo, Brazil.

This "campo cerrado" with scattered trees is in the State of Mato Grosso, Brazil.

agricultural schools of Brazil have brought about a great improvement in cattle breeding. Zebu (Brahma) cattle, being highly disease-resistant, are largely crossed with the native stock. Draft animals are mostly oxen.

The problem of erosion and soil conservation is also coming to the fore in Brazil. So far as my own observations go, erosion is less widespread than in the United States, but in places the earth is deeply cut into badlands, with gullies 50 to 100 feet deep. The devastation of some of these areas was caused by the practice in slavery days of having ditches dug instead of putting up fences. Such ditches, running downhill, became the beds of torrents during heavy rains, cutting the slopes into badlands.

In western Minas Gerais, in Goiaz, and Mato Grosso, along the route followed by the oxcarts from the east to Cuiaba, the head of navigation on Rio Cuiaba, a tributary of Rio Paraguay, the country is badly eroded. The grazing oxen had to be herded near the route, and this resulted in severe overgrazing. The cart wheels cut ruts in the red clay which in the rainy season were deepened by the torrents of rain. The following season the route would be shifted a little, cutting new ruts. Between overgrazing and gullies resulting from ruts, an extensive series of badlands were developed, in some places in Mato Grosso more than half a mile wide.

With the coming of the *caminhão* (motortruck) such devastation is being halted. Except in such areas and in the dry regions of Baía and Pernambuco there is little evidence of overgrazing. Over most of the campos the grass is abundant.

Varied Grass Species

Throughout the campos and also on the island of Marajo, in the mouth of the Amazon, where cattle raising is extensive, species of *Paspalum* furnish an important part of the forage. Of some 160 species of this genus occurring in Brazil only about 20 are rejected by cattle. Dallis grass (*Paspalum dilatatum*), now cultivated in the Southern United States, was introduced from Brazil and Uruguay.

Three other Brazilian species of *Paspalum* have been introduced into the United States for forage: Bahia grass (*P. notatum*), Vasey grass (*P. urvillei*), and more recently *P. malacophyllum*. A related genus, *Axonopus*, also furnishes a large amount of forage. Two of these are carpet-grass and narrow-leaved carpet-grass, esteemed in our southern States.

A species of *Paspalum*, called sourgrass in the West Indies (*P. conjugatum*), is not grazed. In some colonial agricultural journals this grass is said to be good forage. Carpet-grass (*Axonopus compressus*) and this sourgrass are both creeping plants with flat rather broad blades and sometimes grow intermixed. Observing cattle grazing on a slope largely occupied by these two grasses, I examined the herbage to see if both were grazed. I found carpet-grass closely cropped while the sourgrass was untouched, the cattle showing they were keen botanists. A mule I rode in southern Mato Grosso also proved discriminating. He left the narrow trail occasionally to crop the heads of a certain grass. This was the large heavy-headed *Paspalum rojasii*, not very common, but the mule recognized it as readily as I did.

Cattle are far more discriminating than one might expect, certain grasses being rejected. During the dry season in Pernambuco I saw *Trichachne sacchariflora* standing untouched with the ground all around it grazed almost bare. *Paspalum virgatum* and related species, all species of *Trachypogon* and *Diectomis*, and most needle-grasses (*Aristida*) are always rejected. Where these are the dominant species it indicates overgrazing, the animals having grazed the palatable grasses closely, leaving the unpalatable to go to seed.

Brazil is especially fortunate in that grasses inadvertently introduced in the slave trade are excellent forage grasses. *Capim gordura* (molasses grass with us, *Melinis minutiflora*) and *jaragua* (*Hyparrhenia rufa*), both natives of Africa, were so early introduced that both were described from Brazil. Both are self-sowing and, especially molasses grass, are rapidly spreading westward. Molasses grass covers the steep open sides of Pão de Assucar on the harbor of Rio de Janeiro and many other granite rocks. To cattlemen it is a blessing; to the botanist an abomination, because it is spreading across the country, crowding out the beautiful native species. *Jaragua* is less aggressive but it, too, has reached eastern Mato Grosso.

Capim planta (Bermuda grass, *Cynodon dactylon*), also introduced from Africa and the Mediterranean regions, is widespread and in drier regions furnishes a good part of the forage. Guinea grass (*Panicum maximum*), used for bedding on slave ships and introduced in the American tropics wherever such ships were unloaded, is also an excellent forage grass. In Brazil this grass is used also as a soil binder, being planted on steep railroad embankments.

Specialized Tropical Grasses

The grasses of the Tropics belong largely to the more highly specialized forms, the millet tribe (*Paniceae*) and sorghum tribe (*Andropogoneae*). Brazil is the center of distribution of several highly specialized genera of *Paniceae*, such as *Olyra* and related genera with staminate and pistillate flowers in separate spikelets on the same plant, and of *Echinolaena*, *Thrasya*, *Mesosetum*, and others with curiously modified inflorescences.

In addition to their botanical interest many of the grasses of Brazil are strikingly beautiful, especially those of the open summits, 3,300 to 5,300 feet in altitude. Several species of *Paspalum* with racemes like polished silver, golden *Axonopus*, and a ruddy gold *Mesosetum*, toss in the breeze. In marshy places, a small relative of sugarcane, *Eriochrysis cayennensis*, lifts long heads of richest bronze-brown velvet, and *Erianthus*, another relative of sugarcane, bears great feathery plumes of silvery pink.

Besides the highly specialized grasses Brazil is rich in the most primitive but largest of grasses, the bamboos. These range from tree-like forms such as *Guadua superba*, 65 feet in height and with stems up to 6 inches thick, down to slender vines scarcely ¼ inch thick, climbing the trees on mountain slopes and along streams, and hanging from their summits like lacy curtains. These climbing bamboos and the palms, which are always in sight somewhere, except in western Mato Grosso, are the most strikingly beautiful features of the vegetation of Brazil. There are something more than one hundred species of bamboo in Brazil, the commonest being a stiff shrubby *Chusquea*, *C. pinifolia*, which forms a chaparal-like zone just above timber line on the mountains, the zone being called "chusquale."

Huts in the mountains, the walls of which are plastered with mud, are constructed of this bamboo. The canes of several bamboos are used for the bodies of carts and for the walls of dwellings. Vernacular names are used so loosely as to be a source of confusion to foreigners. *Chusquea pinifolia* is called "carrizo," but this name is applied to other species and also to giant cane (*Arundo donax*) and other large grasses. "*Tacuara*" is a general name for the large bamboos, especially species of *Guadua*

The Grasses of Venezuela

In Venezuela the llanos occupy the vast alluvial plain that stretches from southeast of the last range of the Andes and south of the Cordillera de la Costa to the Orinoco, which bounds the elevated tableland continuous with that of Brazil. Much of this plain is inundated during the rainy season, from May to November, by the Orinoco and its tributaries that rise in the Andes, while in the dry season it suffers from extreme drought.

In the marshes along Río Apure, the principal tributary of the Orinoco from the west, are practically pure stands of *Paspalum fasciculatum*, its creeping interlacing stems making a firm network holding the alluvium and its erect stems forming a dense growth 3 to 7 feet tall. Many smaller areas of this grass occur in suitable situations in the valley of the Orinoco. In the Delta, above tidewater, there are extensive zones of this land-building grass.

Gynerium sagittatum, called "*caña amarga*" in Venezuela, holds the riverbanks of the uplands as in Brazil. The stripped stems are used extensively for roofing with thatch of palm leaves, and for ceilings, laid on beams with tiling over it for roofs. It seems to last indefinitely. In the house in Caracas where Bolívar was born some of the rooms have ceilings of *caña amarga*, which are believed to be the original ceilings.

In the country and villages the framework of houses is built of *Caña amarga*, sunbaked brick or mud being laid over the walls, and the roofs thatched with palm leaves.

In the páramos of the Andes, the Alpine regions at 11,000 to 15,000 feet in altitude (what would be above timberline if there were any timber), the dominant plant

This used to be an oxcart trail. Overgrazing along the route and ruts cut by oxcart wheels resulted in erosion.

The land-holding quality of *Panicum rivulare* is evident here.

is a tussock-forming grass, called "*abrojo*" (*Aciachne pulvinata*). This tiny grass, endemic of the páramos from Venezuela to Bolivia, growing on windswept heights, has achieved dominance by extreme reduction. Its stems are but 1 to 2 inches tall, its stiff rolled leaves about a quarter of an inch long, and its inflorescence usually reduced to a single 1-flowered spikelet. The horny floret tightly encloses the stamens and pistils, the flower being self-pollinated—no pollen wasted in the wind. The needle-tipped florets attach the ripe seeds to any passing animal, and the strong winds also distribute the seed.

On the rocky slopes of the Andes, ichu grass (*Stipa ichu*) endemic of the Andes, furnishes forage for sheep and goats. Guinea grass and Pará grass (*Panicum purpurascens*), introduced from Africa but widely naturalized, are abundant, especially in the foothills. Molasses grass (*Melinis minutiflora*), introduced from Brazil in 1860, is common on the slopes in the Federal District and in the state of Miranda. In the Andes it is being planted in reforestation experiments up to 6,500 feet.

Despite reports to the contrary, molasses grass does not repel mosquitoes, ticks, or snakes. This grass does not grow in wet ground where mosquitoes breed. In Brazil cattle kept in *Melinis* pasture are likely to be free of ticks, but this is not because it kills the ticks. Ticks, when mature, drop from the animals to the ground, and the infant "seed ticks" climb the vegetation and attach themselves to passing animals. In the case of *Melinis*, however, seed ticks as well as dust are caught in the gummy velvety foliage and do not transfer to browsing livestock.

Slender vines of bamboo which climb trees on mountain slopes and along streams hang from their summits like lacy curtains.

The llanos, subjected to alternate inundation and drought, are occupied by hardy, mostly coarse, grasses that can endure such severe conditions. The practice of burning the llanos in order to produce young growth has diminished the better grasses, until much of the eastern llanos, at least, are occupied by inferior ones which are more resistant to elimination by fires.

In the days of Bolívar and his loyal *llaneros*, cattle raising was important in Venezuela, but since the discovery of the vast oil fields underlying the plains most of the scant population of the llanos has been drawn to the oil camps.

The present Ministry of Agriculture, realizing the desirability of a home-grown food supply, is encouraging the investigation of forage resources. A young woman who had been a student of Dr. Pittier, the outstanding botanist of Venezuela, and who spent more than a year studying in the Grass Unit of the U. S. National Herbarium, is now agrostologist for the Ministry of Agriculture, the first agrostologist of Venezuela. The work looks very promising. The oil companies are also interested in developing pastures in the llanos to supply milk and meat for the employees.

In addition to alternate inundation and drought these eastern llanos suffer from the eroding effect of strong trade winds from the east. The region is a flat windswept savanna with scattered low trees, bent toward the west by the prevailing wind pressure. The dominant grasses, those that have withstood the combined effects of wind and water, drought and burning, are *Trachypogon plumosus*, *Axonopus anceps*, both coarse and hairy, giving a grayish cast to miles of the llanos, *Paspalum gardnerianum*, and species of *Aristida*, all of little or no forage value, except when very young. But even under such adverse conditions there are a few good forage grasses that may increase if given some encouragement.

One relative of carpet-grass, *Axonopus purpusii*, with long stolons clinging to the windswept earth, and grazed by the few cattle observed, appears promising. Near the *morichales*, groves of moriche palm bordering the rivers, are species of *Paspalum* and *Andropogon* which would furnish fair-to-good forage, but cattle (in 1940) were very scarce in the llanos. Farther east, in the state of Monagas, where low mesas begin, the land is badly gullied and deeply cut, but here, as on the flat plains, there are enough strong coarse grasses to reclothe the land if burning is prevented.

Eventually with such protection the more valuable grasses may be expected to spread and again support herds of cattle.

Bamboo

Introduction of borer-resistant bamboos from the Far East will greatly change farm life in the American tropics for the better. The quick-growing bamboos, almost equaling reinforcing steel in strength, contribute utility, beauty, and comfort to tropical farming.

by ATHERTON LEE

In countries of the Far East—Java, the Philippines, China, and Japan—bamboo has myriad uses. Travelers to the Orient are impressed, not only with the extent to which the people of these countries use bamboo, but also with the effectiveness and beauty of the articles constructed from this material.

Bamboo is used for heavy construction as well as for an almost infinite number of articles for farm, household, and novelty purposes. Roofs, siding, and floors of houses are made of different types of bamboo. It is used to make furniture, such as chairs, tables, beds, bookcases, and benches. On the farm various types of buildings, fences, ladders, bridges, hayracks, poultry runs, irrigation and drainage tubing, and props for garden and fruit crops are commonly made of bamboo. From it are also made many other useful articles, such as waste baskets, table lamps, picture frames, curtain rods, ash trays and holders, cigar humidors, fans, rulers, serving trays, vases, flower pots, fish traps, walking sticks, and paper cutters. In the first World War, when steel was difficult to obtain in China, bamboo was used in building construction to reinforce concrete, and in recent years more detailed research is being carried on for this use in various countries.

After a number of years in Oriental countries, the writer in 1934 came to the Western-Hemisphere tropics and was impressed by the absence of articles of bamboo in farm and household life. Maj. Gen. Blanton Winthrop, U. S. A., was at that time Governor of Puerto Rico, after having served many years in the Far East; he also was impressed by the absence of bamboo utilization in the American tropics in contrast to its widespread use in the Far East.

It quickly developed that there was one outstanding factor, in the West Indies at least, which had prevented much use of bamboo. The one bamboo most commonly grown in the West Indies was the species *Bambusa vulgaris.* This species has canes, or culms, which are comparatively soft and weak and are susceptible to boring insects. Articles made from this bamboo, often within a few months, were riddled by the small powder-post beetle, *Dinoderus minutus.* Yet species of *Dinoderus* were widespread in the Orient. Our conclusion was that the bamboo species used for farm and industrial purposes in the Far East must be resistant to this borer-type insect. A number of the Far Eastern species were immediately secured for experimentation in methods of utilization and especially to determine resistance to borer infestation.

Progress of Bamboo Studies

Fortunately several enthusiasts had foreseen the possible value of oriental bamboo species in the United States and the American tropics. F. A. McClure, working at

A 30-year-old clump of *Bambusa tulda.* The older culms of this clump, harvested from time to time, have furnished a large amount of construction bamboo.

Mr. Lee traveled extensively for some years in the Orient and has first-hand knowledge of agriculture there. Subsequently he was director of the tropical experiment station of the U. S. Department of Agriculture at Mayagüez, Puerto Rico. He has more recently been appointed director of the Department of New Crops of the United Fruit Company. All photos used with this article are furnished by the courtesy of the Puerto Rico Experiment Station, Mayagüez.

the Canton Christian College (now Lingnan University), in China, had already made considerable progress in clarifying the previously confused taxonomy of bamboo species; now, working at the National Herbarium, in Washington, D. C., he is the outstanding authority on bamboo nomenclature and uses. B. Y. Morrison and Robert A. Young, of the U. S. Department of Agriculture, had imported many species of Far Eastern bamboos to this hemisphere and had established them in Georgia, Florida, Louisiana, Puerto Rico, Honduras, and the Canal Zone.

Edward A. McIlhenny of Avery Island, Louisiana, and David Bissett, of Savannah, Georgia, had multiplied and seen the great possibility of the utilization of the temperate-country bamboos. Some of these species persist as far north as Washington, D. C., although not with the magnificent growth attained in the Georgia-Louisiana zone. Farmers in southern United States might consider home-grown bamboos not only as a convenient source of material useful around the farm, but as one means of reducing their outlay for lumber, and a possible source of supplementary income.

The tropical species familiar in the Western Hemisphere have a distinctive habit of growth which is responsible for their being known as clump bamboos. Some of these species were introduced at Coconut Grove, Florida, but in many cases they were found to be definitely out of their proper environment. Many of these were moved to the Puerto Rico Experiment Station of the U. S. Department of Agriculture at Mayagüez, where some 35 species are now established.

The United Fruit Company also has established some 15 or more species at its experimental farm at Lancetilla, Honduras, among which is a *Schizostachyum* species. Bamboo of this genus is used in the Philippines for weaving baskets, mats, and sidings for houses. A few species also were to be found at Summit in the Canal Zone and in several of the botanical gardens of this hemisphere.

At Mayagüez, Puerto Rico, studies of the comparative resistance of these Far Eastern bamboos to boring insects were undertaken. Standardized tests were made, using the powder-post beetle, *Dinoderus minutus*, as the test insect. Bamboo samples of different species were placed in small cages of about 1½ to 2 feet of cubic space. Into each cage 500 of the powder-post beetles were turned loose and kept there for 30 days. At the end of this period, counts of the borer channels on the samples gave a quantitative measure of the degree of susceptibility of each species.

Harold K. Plank at the Mayagüez station continued and improved these tests. He found the species *Bambusa tuldoides*, *B. tulda*, *B. textiles*, *B. longispiculata* and *Dendrocalamus giganteus* notably resistant, and a number of other bamboos still untested can be expected to be resistant to the powder-post beetle. As was expected, the common *B. vulgaris* of the Western Hemisphere in these tests was highly susceptible to the borer. Thus, there are now at least 6 or 8 species of bamboo which can be used for farm construction and furniture without fear of damage from borers.

Plank also studied various methods of curing bamboo. Using *Bambusa vulgaris* as a borer-susceptible test species, he tried impregnation of the bamboo culms, immediately after cutting, by immersion of their butts in solution of such chemicals as copper sulphate, zinc chloride, and other preservatives.

Plank then proved that the age and maturity of the bamboo has much to do with borer resistance. Even culms of the highly susceptible *Bambusa vulgaris*, if allowed to grow for 5 or 6 years in the clump, and, after being cut, are left standing in vertical position with their leaves for a week or so, are much less susceptible to borers than young 1- or 2-year-old culms. He also has established a relationship of carbohydrate content of the culms to borer susceptibility. Apparently the powder-post beetle is seeking starches and sugars, which explains the function of exhausting the carbohydrates by soaking in water, cutting 5- to 6-year-old mature culms, and hardening them in the clump after cutting.

These methods of handling the susceptible *Bambusa vulgaris* when applied to the resistant species such as *B. tulda*, and even the less resistant species such as *Dendrocal-*

Bamboo has many farm uses. Rain shelter for cattle . . .

fences, ladders, and buildings can be constructed at low cost.

Bamboo can be used for irrigation or drainage tubing.

mus strictus, insure little or no damage from borers. Thus, in this hemisphere we are obviously in a position to expand the plantings of the bamboo species less susceptible to borer attack and to undertake more intensive bamboo utilization.

Other Bamboo Problems

Two destructive insect pests attack growing bamboos in the West Indies. Both are scale insects—*Asterolecanium miliaris* and *A. bambusae*. Spraying a crop such as bamboo to kill insects is not feasible in tropical, heavy-rainfall countries and is impractical for small farmers of limited means. An effective remedy, however, has been developed. The writer observed lady beetles, which were feeding upon and destroying these scale insects in Venezuela, Panama, and Jamaica. Kenneth A. Bartlett, at that time entomologist and now director of the Mayagüez experiment station, followed up this lead and imported from Brazil, Trinidad, and Cuba some six or eight *Coccinellid* species which prey upon these scale insects. Harold Plank later brought in another Coccinellid predator from Texas, and the writer brought in still another good predator of this type from Martinique. The use of these imported predators is now effectively controlling these two scale-insect species in Puerto Rico. This procedure should be possible in other Western Hemisphere countries where these scale insects may become an unfavorable factor.

There remains one factor adversely affecting bamboo utilization in this hemisphere. Bamboo furniture frequently splits when moved from the Tropics to steam-heated apartments in temperate climates. This may occur even in the Tropics in climates of alternating extreme wet and dry seasons.

This splitting results from uneven moisture absorption and loss in the tissues of different density in the bamboo. *Bambusa vulgaris*, for example, is well known for its tendency to split; it has soft pithy tissues on the interior, while the outer tissues are much more compact and absorb much less moisture from the air. Fortunately, species with more uniform culm tissues are less susceptible to splitting.

Although the problem of splitting is not yet fully solved, it has been lessened. One partial remedy is to use the species that are most resistant to splitting; or types of construction can be used in which the design calls for split bamboo. Designs can sometimes be carved in the hard outer surfaces of bamboo which permit expansion or contraction due to moisture absorption and loss.

Articles made of bamboo are suitable for office or home use.

Varied Utility

Some bamboos are unusually strong. The Puerto Rico Experiment Station made strength tests of *Bambusa tulda*, a good bamboo but probably not our strongest; 52,000 pounds per square inch were required to break it. Walnut, according to these tests, required 20,000 to 22,000 pounds per square inch, while the steel commonly used for reinforcing concrete required about 60,000 pounds. Certainly such an easily grown plant as bamboo with culms of this strength can have wide usage.

The use of bamboo sprouts as a food is perhaps overemphasized. In China, *Phyllostachys edulis* forms sprouts which, when properly prepared, are appetizing and possibly add something to a diet preponderantly of rice and soybeans. My own experience in preparing sprouts of *Bambusa vulgaris*, the species which the Javanese are said to use for food, met with no success, even though these experiments were with material of different ages and sizes and various methods of cooking. To the varied diet of fruits and vegetables possible in the American tropics bamboo sprouts do not seem as important as in the Chinese, Japanese, or Malayan diets.

The feathery foliage and the symmetrical stems of bamboo make them valuable for landscaping. In hurricane countries their great strength makes them the best possible planting material for windbreaks. They have an extensive intermeshed system of roots which prevents soil erosion on hillsides in countries of beating rains. Some bamboo species are drought-resistant and will grow in poor soils, but they will do much better with ample, well-distributed rainfall and fertile soils. They all need as much sunlight as possible and do poorly where shaded.

Edward McIlhenny, of Avery Island, Louisiana, has

(Continued on page 137)

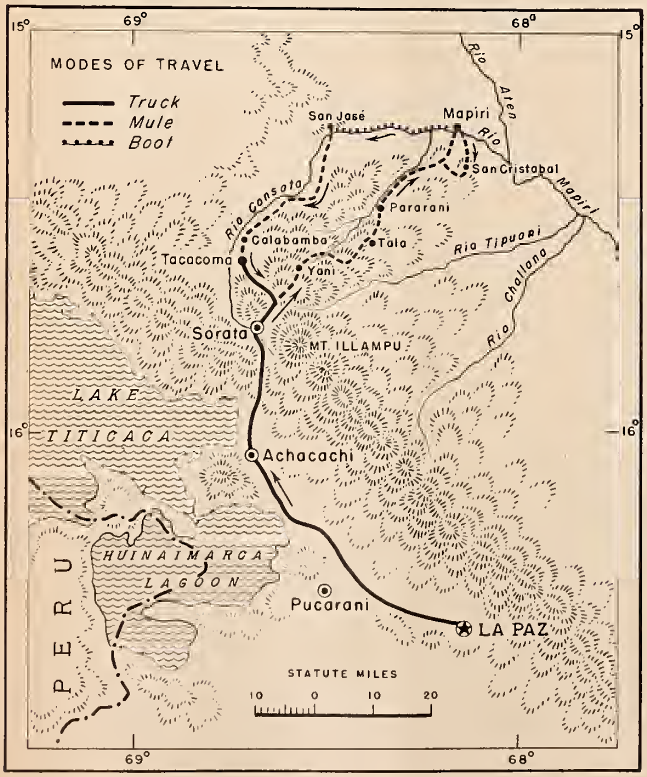
In Quest of Quinine

The task of assuring greater and continuous supplies of strategic crops is not always an easy one, as is evidenced by the following report of a trip by a U. S. Department of Agriculture party in the cinchona district of Bolivia.

by CLAUD L. HORN

With cots, mattresses, blankets, sheets, pillows, ponchos, food, and a guide we left La Paz, the capital of Bolivia, at 11:30 on the morning of July 21, 1943. We went by truck via Sorata as far as the road permitted and then continued by muleback to our destination, the cinchona plantations in the vicinity of Mapiri. The U. S. Government had received word that further cinchona plantings had stopped because of a plant disease and that the help of pathologists was required. The members of the U. S. Department of Agriculture assigned to study the problem were William C. Davis, Bowen Crandall, and I.

Leaving La Paz we crossed the northeastern high plain which gently slopes from the eastern cordillera of the Andes toward Lake Titicaca. The road was graveled and good. Here the terrain is so flat that little grading is necessary to build roads. The only topographic interruptions are the rather frequent glacial moraines composed of all sizes of gravel from sand to boulders. Around Pucarani and Achacachi the soil is light, the result of its being at one time the bed of an extensive lake. Large areas were bare of any vegetation because of salt and alkali deposits.



The trip from La Paz to Mapiri by truck and mule, about 60 miles, required 5 days of travel.

From my vantage point on a gasoline drum in the back of the truck I was able to get a fleeting look at farming operations along this part of the route. The grain and potato crops had just been harvested and the Indian farmers were threshing and repairing the mud walls of their buildings and fences. The women and children, while tending sheep, llamas, cattle, and hogs in the pastures and recently harvested fields, were spinning yarn made out of the wool—presumably taken from their own sheep. The farm houses were of adobe and appeared to be quite well built, having thatched roofs of grain straw.

Peat and a woody weed provide to these farmers a poor fuel since there are few trees on the altiplano. During July (winter season) the rainfall and temperature of this area are so low that not even the grasses do well.

Further Crop Possibilities Are Apparent

Leaving Achacachi, we climbed over more glacial moraines on to the rolling tops of the first mountains. All through the high plain we could see to the northeast the gorgeous eastern range of the Andes! The road took us near Illampu, one of the highest mountain peaks in this hemisphere. It is approximately 21,500 feet high and is always covered with snow. There are many glaciers in the mountain peaks near Illampu, the melting snow from which feeds streams running across the plains into Lake Titicaca. On their way, some of these streams spread out, lose any semblance of channels, and thus develop large areas of marshland—the sources of peat. Marshlands which frequently adjoin arid areas suggest the availability of water to irrigate crops. The presence of chrysanthemums, growing as ornamentals, further suggests the possibility of pyrethrum production in these high plains.

As we left the high plain, we ascended to the mountain-

Mr. Horn is on the staff of the Office of Foreign Agricultural Relations in charge of technical aspects of agricultural research in connection with the U. S. Department of Agriculture's programs in Latin American countries. All photos used with this article are furnished by the author.

Illampu is one of the highest mountain peaks in this hemisphere. Glaciers up here feed streams that run into Lake Titicaca.

top grazing area, and up at this higher level there were many patches of Irish potatoes. The Indians plant their potatoes on flat-topped banks about 8 inches high. The soil is black and full of humus which, presumably, is derived from mosses, one of the most prevalent types of vegetation.

Then, down breath-taking slopes and over the most crooked of roads we came to an area of barley, corn, wheat, and sheep production. There were numberless varieties and colors of corn. At 7:00 in the evening we arrived at the little town of Sorata in the floor of the valley—elevation 8,000 feet. Here, at the home of Mr. Fernholtz, who had made the trip from La Paz with us, I saw boa constrictor skins 18 feet long and a rug made from the hide of an anteater.

The next morning we climbed to about 14,000 feet to the short-grass- and moss-covered mountains well above the tree line. Near the end of the truck road we scared up five condors, the largest and most powerful of flying birds.

On Muleback at 15,000 Feet

Up at this point, about half way between the towns of Sorata and Yani, a new chapter in our transportation began—we shifted from the truck to muleback. I had not been on a horse for about a year and never on any kind of animal on a narrow and precarious mountain trail. Among snow-capped mountain peaks we continued to climb until about noon, when we reached the highest divide of the trip—15,600 feet above sea level. Llamas were the only animals to be seen up here, short grasses and mosses the dominant vegetation. On the divide there was a large pile of rocks, each about the size of a man's two fists. The Indians, we were told, pick up a stone as they climb and when they reach the crest they throw the stone on this pile with a prayer. A short climb on foot to a better vantage point from which to take a picture of Illampu convinced me that there was scarcely any oxygen in the air.

Leaving the crest of the divide, we ran into clouds which turned into rain, then sleet, and then snow, but we rode out of this before the trail became too hazardous. Descending to a fairly large river, the rocky banks of which in bygone days had been torn up by gold-mining operations, we again found shrub vegetation and quite a few llama herds. The only human habitants of this area are a few hangers-on from gold-mining days. We reached Yani at 4:30 in the afternoon. It was cold and foggy. The streets, such as they are, are cobblestone; the houses are built of black shale and have grass-thatched roofs.

From Yani the next morning the trail took us up and down mountain after mountain. As the day wore on, awareness of my proximity to the mule became more and more acute. But the mule has my profound admiration! He climbed or descended the stair-like trail with little hesitancy, rarely drank water, and fared nicely on the little nourishment he could get from an hour's grazing each day. We met several mule trains hauling alcohol and cinchona bark. At 6 p. m., after going about 26 miles—horizontal measurement—we arrived at Tola, a one-room station by the side of the trail. All of us stayed at Tola over night and by this time our party, in addition to Davis, Crandall, and me, consisted of the muleteer, the mule owner and his two sons, a German merchant of Rio Beni, a Brazilian headed for the Amazon, and a young man fresh out of a La Paz school on his way to his first job as bookkeeper for an hacienda near Mapiri.

Orchids and Bamboo

Soon after we left Tola the next morning, each succeeding mountain got lower until we had descended to shrub vegetation again. The first plants that interested me were climbing bamboos and orchids. Some of the orchids were in bloom. One looked like the vanilla-producing type except that it did not climb but stood erect in the soil from 6 to 7 feet high and had a showy bloom. The bamboos, with stalks one inch in diameter and 70 feet long, climbed over everything. The mules ate one of them. There was a large amount of sphagnum moss, a valuable product in nursery propagation work. The trees were getting larger now, and we saw the first bananas, citrus, papayas, and other tropical fruits.

At Pararani, where we stopped for the night, it felt wonderful to get thawed out again and to have fresh fruit. Next day the trail from Pararani to Mapiri was pleasant and for the most part downgrade. During the early part of the day we rode through stands of wild cinchona and by midafternoon had descended to Mapiri, our destination. As villages go, Mapiri is a small place. It has two cathedrals and about 30 houses including several stores and a branch of the Banco Mineral. All buildings have adobe walls, dirt floors, and grass-thatched roofs.

Chiliza, one of the haciendas at Mapiri, is owned by Abel Pacheco but is operated by his son, Hugo, who recently attended short courses in sugarcane production in Louisiana and Florida. Here, at the Pacheco home, we very appreciatively took advantage of the first opportunity in five days to bathe and shave. Considerable sugarcane is grown on Hacienda Chiliza and is converted into alcohol right there because alcohol is easier to transport on muleback. Other crops grown along the river are plantains, bananas, and cassava but these crops are not of much consequence. Hevea rubber trees grow wild near Mapiri and, at the time, preparations were being made to tap them.

All the buildings of Mapiri have adobe walls and grass-thatched roofs.

Boa constrictor skins 18 feet long adorn a living-room wall.

In addition to the alcohol factory at Chiliza there is a fairly good saw mill and machine shop, all parts of which came over the hazardous mountain trail on the backs of Indians or mules. Incidentally, in the Pacheco home there is a full-sized upright piano that also came in on the backs of mules. In the evening of our first day at Mapiri some Indians brought in a small boa constrictor which they had beheaded.

Plantation Cinchona

On the 27th of July Davis, Crandall, Hugo Pacheco, and I left Mapiri for San Cristóbal, which is a part of Hacienda San Antonio, also owned by Abel Pacheco. To reach the cinchona stands on this hacienda we went on muleback what seemed to be straight up for almost an hour and a half. The first plantation-grown cinchona we saw looked good—the 4-year-old trees were from 8 to 10 feet high.

Plantation cinchona in Bolivia has been named *Cinchona calisaya vera*. Another variety, *Cinchona calisaya josepha*, is a shrub that grows on the thin-soil ridges along with a straw grass called *paja*. Consequently, *josepha* cinchona is locally called cinchona *pajanol*. This latter variety is of slow growth and the bark, probably because of the difficulty of removing it and its comparatively low quinine content, is not harvested.

In preparing land for cinchona, the practice has been for the Indians to go in and fell everything in the forest. About 9 months later they set fire to this mass, which leaves only the large tree trunks, ashes, and a small part of the duff. Then, cinchona plants about 4 inches high are transplanted directly from a shaded seedbed into holes 8 to 14 inches deep and about 6 inches in diameter. In setting these plants the Indian planters usually ram the tender plant clear to the bottom of the hole, doubling up what roots there are. Then the roots are covered with some of the woods soil and finally the deep hole with the set plant is covered over with a slab of bark. Remarkably enough, the plants do survive and send roots up into the soil just under the duff. Later, however, waterborne fungus enters the mutilated base of the plant and kills it. Whole plantations have died as a result.

Balsa Boats

On July 29, after several days of study, observation, and collection of data, we were ready to begin the return trip to La Paz but over a more northerly route, the first part of which was by balsa boats up the Mapiri River. These balsas, the first I had ever seen, consist of seven balsa logs each 6 inches in diameter and about 12 feet long, all held together with palm-wood dowels. The three middle logs turn up at one end to give a sled-like effect, the better to scoot over rocks and other obstructions that might be in the way. A finishing touch is given by driving pointed bamboo splints into the logs to support a bamboo superstructure, a sort of tray-like arrangement about 10 inches above the upper surface of the balsa. In this superstructure Davis, Crandall, and I started our homeward trek in blissful comfort compared to the muleback experience coming in.

Balseros (balsa boat operators) pull these boats up the stream, one on each side walking on gravel bars or knee-deep in the water at the end of 70-foot ropes, and a third man acts as pilot. So, in our "fleet" of two balsas there were six people in addition to our immediate party. Although the river was crooked and composed of many rapids, the *balseros* enjoyed their work. The most practical way to get from one gravel bar to the next, we learned, was for the *balseros* to jump aboard and push out in the swift current so the balsa would be taken across quickly. This seemed like a precarious procedure at first, but with each successful conquest over the rapids our consternation diminished.

Cinchona bark from twigs and small stems of plantation calisaya.

At 4 o'clock in the afternoon of the first day out we stopped on a gravel bar and in a very few minutes the *balseros* had pitched camp for the night. Tepees were built by setting up two poles about 12 feet apart connected at the top with other poles and all covered with palm leaves. We slept on cots under mosquito nets. From our camp site and during the day it was apparent that the vegetation along the river gorge was not good. The trees and other vegetation consisted of several species of palms, philodendrons, and anthuriums, two types of bamboo, and several kinds of orchids. At nightfall the parrots began winging their way up the river to the highlands to roost. At first small flocks of only 25 or 30 came along but they grew in size until each flock contained a thousand or more, and there were many, many flocks.

Mules Again

We broke camp early the next morning and continued the journey up river. It rained until about 10 a. m., and to help keep us dry the *balseros* made a canopy of bamboo poles and rubber ponchos. We reached the terminal for balsa navigation at 12:30, ate lunch, and by that time the mules had arrived on which we were to continue our trip. After loading ourselves and equipment onto these tough little beasts of burden we climbed a steep freshly made dirt trail to San José. We spent the night most uncomfortably at San José because it rained hard and our only protection was an old palm-thatched roof.

Next day the trail practically paralleled Río Consata through a good forest still within the cinchona belt. During the day we went through a belt of talc. Clay soils are predominant all through this region and apparently are highly acid, for leguminous plants were rarely seen. About 3 p. m. we suddenly went from forest to virtually desert conditions. In this new environment mimosas and cactus were the prevailing vegetation, with *Opuntia brasiliensis* the most conspicuous. We stopped for the night at a place called Hajusani, setting our cots up in a pen that contained a wood-roller sugarcane mill. We were told that some years back the Japs tried to mine gold along the Río Consata and did well until tertiary malaria killed them all.

About noon the next day we left the fairly level trail along the Río Consata and began the ascent, mainly on

(Continued on page 136)

Copey Oak in Costa Rica

The recent finding of an almost pure stand of a new species of oak in Costa Rica would seem to be further evidence of untapped resources in Central America.

by WILLIAM A. DAYTON

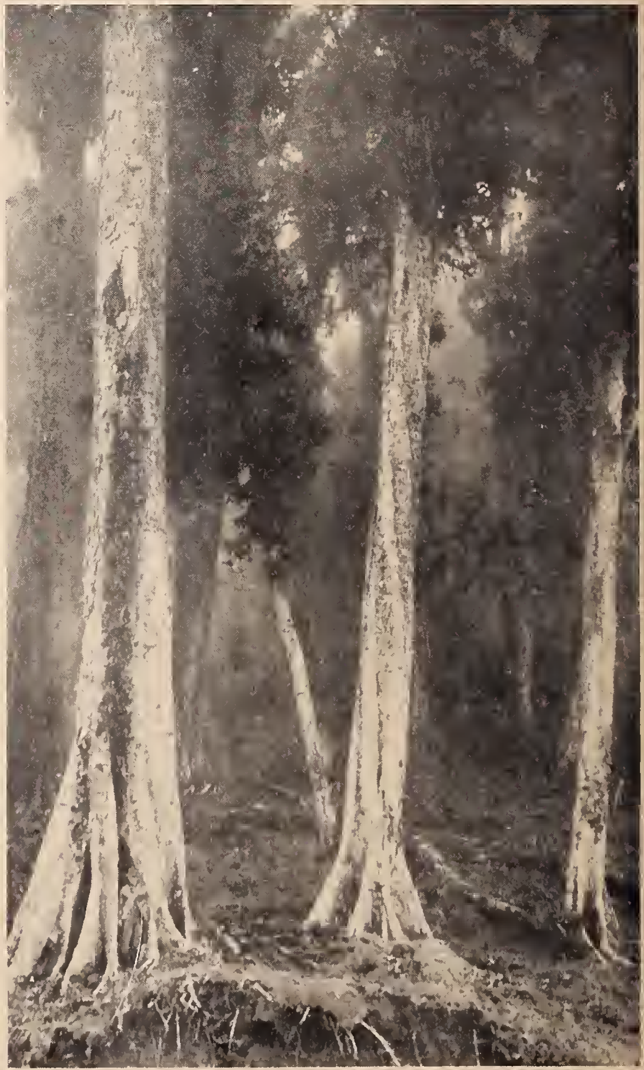
Less than 2 years ago when engineers were plotting the right-of-way for the Inter-American Highway in Costa Rica they found a magnificent stand of giant oak trees in a hitherto unexplored and nearly impenetrable wilderness. Foresters working in the area described the trees as being in a forest of almost pure stand, quite unlike any forest seen in tropical America before.

These foresters—Arthur Bevan, William R. Barbour, and E. L. Little, Jr., of the U. S. Forest Service—operating under a grant from the Office of the Coordinator of Inter-American Affairs, had been assigned to give technical advice on woods to be used in construction of the highway. They were, probably, the first foresters and botanists to see this unique oak forest.

At first blush it seems odd that Costa Rica, a country smaller in area than the State of West Virginia, should have as many tree species as the entire United States—and probably more, as new trees are continually being discovered there. Also, the fact that it was settled four centuries ago by white people and has been rather intensively explored by botanists for more than a century—including such distinguished figures as Oersted, Lehmann, Warscewicz, Tonduz, Wercklé, Brenes, Pittier and many others—makes it seems paradoxical that what is perhaps the largest oak forest in the world occurs in Costa Rica and was unknown to any of these men.

Finding of this new timber supply led foresters to study the species. They found that in July 1942 Dr. Cornelius H. Muller, then a member of the USDA's Bureau of Plant Industry, wrote about a new species of white oak, botanically named *Quercus copeyensis* Muller, the description of which tallies with the new finding. Dr. Muller described this oak from four specimens collected between 1874 and 1925 in San José and Cartago Provinces, Costa Rica, and one specimen collected in 1940 on the slopes of the volcano Chiriquí in nearby Panama. There was nothing in Dr. Muller's description to indicate that this oak is out of the ordinary. He described it as being "15 meters [about 48 feet] in height or taller"; it seemed to be merely one of the 16 species of oak collected so far in Costa Rica. Dr. Muller named the species *Copeyensis* from the little town of Copey, near which he first found the tree. Correspondingly, the English name, "Copey oak," and the Spanish name, "*roble Copey*", are proposed for the species.

Until 1943, this oak seems to have been known only as a more or less isolated tree and, within its range, occurring in mixture with other oaks and a variety of other trees. However, when the engineers opened up



The Copey oak measures 8 feet in diameter at breast height and 80 feet up to the first limb.

Mr. Dayton is in charge of Dendrology and Range Forage investigations of the U. S. Forest Service. He served as dendrologist of the Forest Service party in Costa Rica from the latter part of April to July, 1943, and, in this capacity, twice visited the Copey oak forest he here describes. Mr. Dayton is perhaps best known for his publications on native range plants and as joint author, with Harlan P. Kelsey, of "Standardized Plant Names".

the route of the new Highway, the oak was discovered in an almost pure stand—quite unlike the typical forest of the Tropics—and in all the majestic grandeur of its optimum size. Barbour measured a Copey oak 120 feet high, with a diameter of 8 feet at breast height; he estimated that extensive areas will run 20,000 board feet to the acre, and that individual acres will run at least 60,000 board feet. Bevan gives his opinion that this forest "is perhaps the largest single stand of oak timber in the world." He estimated the largest specimens as 125 feet or more tall, with a diameter of from 7 to 8 feet above the buttresses, which rise to a height of 10 or 12 feet above the ground, the clean boles tapering gradually 80 feet to the first limb.

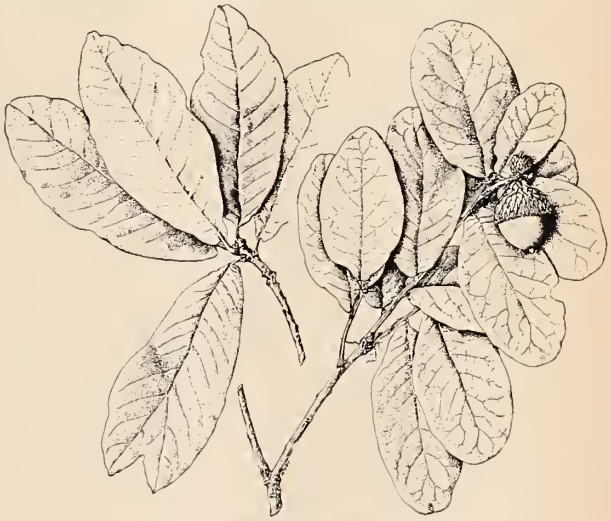
The immense size of these trees in a veteran stand is hard to realize unless one sees a man or some familiar-sized object beside one of these giant oaks. This may prove to be, on an average, the largest oak tree in the world, surpassing in size the valley oak of California and the white oak of the eastern United States. Copey oak trees cut down along the right-of-way of the Inter-American Highway are almost always sound and obviously of great age. Tests of the wood made at the Forest Products Laboratory in Madison, Wisconsin, show that the wood has a hardness between that of white and live oaks, and that the bark has a high concentration of tannin. The bark varies from a characteristically rough appearance like that of the post oak to an extremely scaly type like shagbark hickory. Barbour describes this oak leaf as "entire, ovate, and 3–4 inches long," and the acorns as being large and round.

The extent of this great forest is not now known, the region being unexplored, but airplane reconnaissance indicates that it extends along the Continental Divide past the Panamanian border, and probably covers over 30 square miles. The occurrence of this great Copey oak forest of fairly uniform size and age, with only a slight admixture of other trees (chiefly as understory) and with relatively little reproduction, forms a fascinating subject for speculation and further scientific study. The location of the forest, high on the *Cordillera de Talamanca*, at heights often above 8,000 or 9,000 feet, is rather unusual. The appearance of the forest is quite awe-inspiring, causing Bevan to dub it "the ancestral home of the gremlins," an allusion to the weird light effects and swirling mists which give this type of cloud forest an almost unearthly and "spooky" appearance.

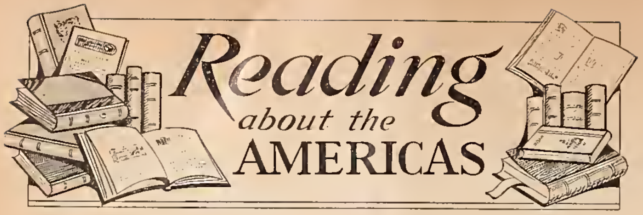
Generally speaking, oaks (*Quercus* spp.) form one of the largest and most outstanding of all tree genera; nearly 400 species have been described from North America alone. Their woods, because of their abundance, size, general utility, and durability, rank among the most important hardwoods of commerce. The bark of some species is valuable in tanning and for medicine; one species produces the cork of commerce. Their characteristic fruit (acorns) provides mast for wildlife and domestic animals and, in some cases, food for human beings. The herbage of many species is a valuable source of livestock browse. The galls of some members are used in medicine and the arts. The shrubby species often blanket slopes with a protective cover of chaparral, and thus have favorable watershed influences. Many of the species are valued as ornamentals.

Oaks are confined to the Northern Hemisphere and occur naturally south of the Equator only in the fossil state. Why they have disappeared from the southern half of the globe is one of the mysteries of science.

Until the opening of the Inter-American Highway, this great natural forest was so utterly inaccessible as to be in little danger of destruction. With the Highway traversing the heart of this forest for many miles, however, there is real danger of destructive exploitation. In the realization of the great value of the forest, both from a physical and an esthetic standpoint, an effort has been made urging the preservation as a national park of the portions that lie along the route of the Inter-American Highway. When Vice President Wallace visited Costa Rica in March 1943, Bevan accompanied him on a visit to Sr. Montealegre, the Costa Rican Minister of Agriculture, at which time the subject of preserving a screen of this forest along the Highway, in the form of a national park, was discussed. Notice has been received that Dr. Jorge León, Botanist of the *Museo Nacional* in San José, has been appointed a member of a commission of six conservation-minded Costa Ricans *"para estudiar las formas y medios necessarios para conservar nuestros bosques"* (to study forms and means necessary to conserve our forests). This is a consummation devoutly to be wished, as already selfish promotion interests have cast covetous eyes on this extraordinary forest, looking toward wholesale commercial exploitation.



Spray and acorns of the Copey oak.



Reading about the AMERICAS

Edible and Poisonous Plants of the Caribbean Region. Prepared by B. E. Dahlgren, Chief Curator, Department of Botany, and Paul C. Standley, Curator of the Herbarium, Field Museum of Natural History. Issued by the Bureau of Medicine and Surgery, Navy Department. 102 pp., illus. U. S. Government Printing Office, Washington, D. C.; 1944. A manual designed to aid the serviceman to live off the land if he becomes separated from his unit. It illustrates and describes common edible and poisonous plants of the Caribbean region, particularly of Central America and the West Indies.

Mexico Speaks, by Guido Rosa. 250 pp., illus. John Day Company, New York; 1944. Guido Rosa, a commercial artist, traveled through Mexico in a small car, with a camera, a notebook, and Juan. Juan was mechanic, guide, philospher, friend, the entire cost of whom was "only four dollars a month and a few tortillas." The author records what the plain people of Mexico allegedly say to each other about life, war, Mexico, and the United States.

Middle America, by Charles Morrow Wilson. 317 pp., illus. W. W. Norton & Co., Inc., 70 Fifth Ave., New York; 1944. This new book presents some material covered in earlier writings of the author, but it has much that is new. There are chapters on the strategic crops of Middle America, as well as on the old stand-by, bananas, and on the place of the airplane in the new development of the countries of Middle America and their service to the United States. One of the most sympathetically done sections is on the fight against malaria and other tropical diseases.

Entomología Agrícola del Peru, by Johannes E. Wille T. 468 pp., illus. Estación Experimental Agrícola de La Molina, Direccíon de Agricultura, Ministerio de Agricultura, Lima, Peru; 1943. A manual in Spanish for farmers, students of agriculture, entomologists, and all persons interested in agricultural entomology. It is the result of the investigations, by the author and his assistants at the experiment station La Molina, of insects, not only those which attack cotton and sugarcane but those which are harmful to all agricultural crops in Peru. It also contains many items on insecticides that will be of interest to the chemical industry.

Posibilidades del Cultivo del Algodón en Nuestro País, by Tomás Erickson. 75 pp., illus. Imprenta "La Opinion," Ciudad Trujillo, Dominican Republic; 1944. This publication of the Secretary of Agriculture, Industry, and Labor in the Dominican Republic considers the possibility of raising cotton in that island republic. It discusses the history, species, and varieties of cotton; the climate, preparation of land, and season of planting; the yield; pests and diseases; the markets and commercial classification of cotton; and uses of seeds.

Low-Cost Housing in Latin America. 20 pp., illus. Pan American Union, Division of Labor and Social Information, Washington, D. C.; 1943. The problem of providing low-cost housing to workers in Latin America is discussed.

EDITOR'S NOTE.—The listing of publications here does not necessarily imply an endorsement of them by the Department. For copies of private publications, write direct to the publishing agency given in each case.

IN QUEST OF QUININE

(Continued from page 133)

foot, to Colabamba. After traveling through areas that showed scattered ruins of an extensive agricultural community now completely abandoned—perhaps to the mosquito—we reached Colabamba, elevation 9,650 feet. This was the first montaña area we had come to on the return trip. Corn was the dominant crop here but some barley, potatoes, wheat, and *ocas* were growing. The corn, of all varieties and colors, had just been harvested. Sheep and other livestock were grazing in the pastures. We spent the most miserable night of our entire trip at Colabamba because no accommodations were available. We simply set our cots up on the lee side of an old oven and the night was cold, windy, and damp. In exchange for some quinine for her son who lay seriously ill with malaria an old Indian woman gave us some coffee and eggs and sold us some forage for our mules.

The next morning we resumed our steep climb until about 10 a. m., when we reached a level section of trail along which grew many beautiful wild flowers, the most common being lobelias. Reaching Tacacoma at noon, we put up at a relatively good inn. Outside it was misty, cold, and cloudy. The truck trail to La Paz starts at Tacacoma, so we telegraphed for a truck to come and pick us up.

We spent the 3d and 4th of August at Tacacoma hovering over a little charcoal stove trying to keep warm until the truck came. It arrived on the 5th at 3 p. m. and at 3:15 we were on our way to Sorata and La Paz. This section of the truck trail was new and very narrow. Once we met another truck and we got through only after selecting what seemed like a wide spot in the road and then digging a hole in the bank.

Between Tacacoma and Sorata the road climbed to 15,600 feet, where there were snow and icicles and the air was so thin we had difficulty in making the truck go. After reaching the summit we descended sharply to Sorata. The streets looked wide, the plaza big and beautiful, and the lights particularly bright!

ALONG THE *Agricultural Front*

▲ Brazil Developing New Pineapple Varieties

The Agronomical Institute at Campinas in the State of São Paulo, Brazil, has for several years been attempting to develop new varieties of pineapple, according to a recent official report. Existing varieties have been crossed with wild and imported varieties, one of the objectives being to produce a plant that does not have thorns on the leaves. Some work with fertilizers and spacing of plants has also been done at the experiment stations in Limeira and Tatui.

Climate and soil in the State of São Paulo, the report says, are considered favorable for growing pineapples. The amount and distribution of rainfall are usually adequate, but at times there is heavy rainfall during the harvest period. Only one insect, the weevil, has been known to cause any damage in recent years. Frost severe enough to cause damage occurred in 1918, 1942, and 1943.

The three principal varieties of pineapple grown in São Paulo are: *Yellow Boituva*, which produces a yellow fruit, is sweet, averages about 4 pounds in weight, and is considered one of the best grown in the State; *Pernambuco White*, which averages about 3 pounds and has a good flavor but requires a better soil and has a smaller yield; and *Smut Carana*, which is grown only in small quantities. Its chief advantage is the relative absence of thorns on the leaves.

▲ Inter-American Economic Conference in the Offing

The Governing Board of the Pan American Union, according to an official report, has received from the Inter-American Financial and Economic Advisory Committee a program for the Inter-American Technical Economic Conference, as provided for in a resolution adopted at the Third Meeting of the Ministers of Foreign Affairs of the American republics. The Board resolved to transmit the prospective program to the Governments of the American Republics for observation and comment, with the request that their replies be transmitted to the Pan American Union on or before the 15th of this month. Upon receipt of these replies the Board will proceed with the final formulation of the agenda and also fix the date of the Conference.

The program as formulated by the Financial and Economic Advisory Committee is divided into five sections covering production, marketing, and disposal of surpluses; finance and credit; transportation, communications, and tourism; emergency economic controls; and post-war commercial and economic policies.

▲ Wool Yarn Now Being Made in Colombia

A recently established company in Colombia known as "Filana" has completed installation of machinery and is now in full production of wool yarn, according to a report from that country. Monthly production of No. 4 and No. 12 yarns totals about 18,000 pounds of carded yarn, which is sufficient to supply about one-third of the local demand.

The wool from which this company is making yarn is mostly imported, but an attempt is being made through the Government bank known as *Caja Agraria* to import 3,000 purebred sheep to increase local wool production.

▲ Argentina to Construct More Underground Silos

The Argentine Ministry of Agriculture recently announced its decision to issue bids for the construction of underground silos in five different localities of Argentina, namely, Isla Verde and Marcos Juárez in the Province of Córdoba, Las Rosas and Cañada de Gómez in the Province of Santa Fé, and Necochea in the Province of Buenos Aires. The silos to be constructed under these bids will have a capacity of approximately 10,000,000 bushels of wheat. Future plans, in addition to construction already underway, call for structures capable of storing and conserving up to 37,000,000 bushels of wheat belonging to the Government.

▲ Balsa Wood Being Processed in Costa Rica

In Costa Rica at the seaport Limón there has been established a plant for processing balsa wood gathered in the northeastern part of that country. Logs handled by this new plant will be floated down to the Caribbean by river and then transported to Limón for planing, sawing, and drying before being shipped to the United States for war purposes.

BAMBOO

(Continued from page 129)

prepared figures regarding yields of pulp per acre from bamboo, compared to forest trees, which show that a good stand of spruce in Canada at the age of 80 years yields about 18 tons of pulp per acre; a good stand of pine in the southern United States at the age of 20 to 28 years will yield about the same, 18 tons. He says that some bamboos will produce a greater yield of pulp per acre after 6 years of growth and thereafter produce such yields per acre annually. Certainly the warmth and moisture of the Tropics working through the proper instrument, possibly bamboo, can yield greater tonnage of cellulose fibers per acre per year than climates with temperatures permitting but a few months of growth per year.

Bamboos seem to have possibilities for improving standards of living for the small farmer in the American tropics, possibly greater than any other crop. Bamboos also have possibilities for cutting farm costs and increasing farm income for both small and large farmers. Propagation of many species of bamboo must be by vegetative means and, consequently, is slow. But the next few years should see extensive plantings of these borer-resistant, industrial bamboos and their widespread utilization.

▲ Guatemala Provides Credit for Small Farmers

An executive decree recently became effective in Guatemala which provides agricultural credit to small farmers. The decree instructs the *Crédito Hipotecario Nacional de Guatemala* to open agencies and branch banks in the various Departmental capitals or other towns to carry out the purpose of the decree.

Loans will be made for the sole purpose of developing and improving agriculture, cattle raising, and for small rural industries. The amount of any loan will be limited to 500 quetzales ($500) and the amortization period will be restricted to 2 years. Not more than 6 percent interest will be charged. As security the borrower will be required to give a lien on agricultural crops, livestock, or industrial assets but in special cases first mortgages may be allowed.

▲ Quinine Manufacture Begun in Brazil

The first processing, in Brazil, of cinchona into quinine took place a short time ago. The first quinine tablets made were presented to President Getulio Vargas by the directors of the Brazilian Quinine Company of São Paulo. Cultivation of the cinchona from which this quinine was made, began in Brazil in 1938, when the U. S. Department of Agriculture presented Brazil with 1,000 seedlings of *Cinchona ledgeriana* which had been imported from the Far East.

▲ Jute Experiments Begun in Dominican Republic

In an effort to produce locally raw material required to make bags for coffee, cocoa, and sugar the Dominican Republic has started experiments in the production of jute. Samples of the first locally grown jute are being sent to the United States for testing. Seeds now on hand in the Republic are believed to be sufficient to plant approximately 3,000 acres to this crop.

CHILEAN ENGINEER APPLIES TRAINING OBTAINED IN U. S.

(Continued from page 122)

Señor Ayala during his training here helped the field engineer in constructing the 200-mile line that carries REA-financed power from the Grand River dam in Oklahoma to an aluminum plant in Arkansas. Later, with other Latin Americans, he helped stake and build electric lines serving farmers in the area of the Pearl River Valley Electric Power Association in Mississippi. To further broaden his knowledge of electrical equipment he visited factories where line equipment and appliances are made for the other American republics. Señor Ayala spent the latter part of his year of training in the various divisions of REA's St. Louis office.

Photo by Stephens—REA

Since his return to Chile, Ayala has made good use of the training he received in the United States. *Fomento Corporación*, the Chilean Government's public works agency, has placed him in charge of electrifying rural areas in one of the large central regions. Already he has helped farmers form three of the nation's first rural electric cooperatives. These are expected to buy power from Government hydroelectric stations which will tap the energy of swift streams flowing into the Pacific—Chile's No. 1 power resource.

Señor Domingo Santa-Maria, who is in charge of Chile's new electrification program, had this to say of Señor Ayala: "We regard him as one of our fine young engineers; he is doing a splendid job. The knowledge he received in REA will assist our Government materially."

▲ New Uses Found for Bamboo Poles

In addition to uses of bamboo listed in this issue's article on Bamboo, page 127, still other needs are being met with this versatile member of the grass family. As a result of experiments with plastic treatments, a manufacturing company using poles of *Phyllostachys* bamboo grown at the USDA's Plant Introduction Gardens at Savannah, Georgia, has made them acceptable in place of the formerly imported Tonkin bamboo.

These plastic-treated poles have been used successfully for military ski poles and for detachable masts on Coast Guard vessels. They also have been used for vaulting poles, fishing rods, ski poles for sports use, and for other purposes for which poles were formerly obtained from Asia. The Agricultural Research Administration of the USDA also reports supplying raw material for promising commercial experiments with bamboo pulp as a source of very thin white paper such as is used for cigarettes.

▲ Large Irrigation Projects Under Way in Brazil

Irrigation projects are nearing completion in the States of Maranhão, Piauí, and Ceará, Brazil, that will favorably affect crop production on some 260,000 square miles of drought area, according to F. Duffy Murry, irrigation technician of the Institute of Inter-American Affairs. He further stated that a big dam, with a storage capacity of 720 million cubic meters will soon be finished at Curema that will provide hydroelectricity of 2,000 horsepower. In addition to irrigation ditches and dams, a network of roads is being built to provide transportation.

AGRICULTURE IN THE AMERICAS STANLEY H. GAINES, EDITOR

A monthly publication of the Office of Foreign Agricultural Relations of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents per copy, or by subscription at the rate of 75 cents per year, domestic; $1.20 per year, foreign. Postage stamps will not be accepted in payment.

Gifts of the Americas

IPECAC

by BEATRICE Du FRANE

In the remote, moist, shady forests and swamps of Latin America, inaccessible during much of the year, grows the "golden root," ipecac. Compounds prepared from this plant are used as an emetic in internal poisoning and as an expectorant in bronchitis and coughs. When combined with opium, in a preparation known as Dover's powder, its diaphoretic properites (ability to induce perspiration) are brought into play.

Emetine, one of the principal derivatives of ipecac, has been found by physicians to be almost indispensable in the treatment of amoebic dysentery. Because of its emetine content, ipecac is vitally important to our troops in tropical lands, where water and food must often be used without proper health safeguards.

Ipecac was first introduced into Europe from Latin America in 1672 by a Dr. Legras, who sold ipecac roots to French pharmacists. It was Dr. Legras who first called ipecac the "golden root," so named for the value he sensed in it. Following tests made on condemned prisoners by a Dr. Hervetius, the value of this plant as a medicine became known to Louis XIV.

Ipecac, also known as *poaia,* is native to Brazil, Colombia, Bolivia, Venezuela, and Central America. It is a small, perennial, shrub-like plant, *Cephaelis ipecacuanha,* belonging to the family *Rubiaceae,* and flourishes in tropical regions with an annual rainfall of 60 inches or more. Growing in dense shade, ipecac thrives in moist, easily pulverized topsoil, rich in humus content and a clay subsoil. A herbaceous plant, its stalk is somewhat woody, and its flowers are white. The leaves grow singly and are oval-shaped and veined, dark green on the upper side and light green underneath. When the plant is about a year old, the stalk begins to lean toward the ground and forms a false rhizome (underground rootlike stem).

From the root and dried rhizome of the *poaia* comes emetine, a white, bitter, and colorless substance. The roots, slightly musty in odor and bitter to the taste, are ringed and of a greyish-brown or reddish-brown color. The interior is white or greyish, with a hard, wiry center. Ipecac roots vary in emetine content from a very slight amount up to 2.5 percent. One pound of roots yields about 430 medicinal doses. Also present are a vaporizable oil, starch, gum, and a glucoside. In Latin America only wild plants are harvested, no attempts having been made to cultivate ipecac or to discover ways of increasing its alkaloid content. Because the plant matures slowly, two to four years elapse before it attains a marketable size. By that time it usually develops 10 to 12 usable roots, with an average weight of three or four ounces each when dried.

Cultivation of ipecac offers interesting possibilities. England is attempting to cultivate the plant in India for domestic use, and has succeeded in growing ipecac in Malaya. Yields averaging from 50 to 60 pounds per acre have been obtained in Malaya, and experimental plots have yielded as much as 600 pounds per acre.

In Brazil, where ipecac of highest alkaloid content grows—2.5 percent—harvesting operations are carried on from November to April by *poaeiros* (ipecac collectors). About 1,500 men are employed annually for this purpose. Each man is equipped with a month's supply of food, a number of sacks and a *saracua,* which is a hollow, sharp-pointed, iron cone fitted with a wooden handle, operated as a lever to extract the plant from the soil. When the *poaeiro* finds a stand of ipecac, he builds a hut in which he lives during the entire harvest period. Social contacts, even with his own family, are impossible. His only visitor is his employer's agent, who once a month brings him food and collects the accumulated roots.

In harvesting, the *poaeiro* grasps the plant with one hand and with the other uses the *saracua* to loosen the roots. Then he lifts the plant from the soil. Usually sufficient root and rhizome remain in the ground to produce a new plant. Each day's work yields from 8 to 30 pounds of ipecac. The roots are carried to the hut of the *poaiero,* where they are dried, first over a slow fire and then in the sun. After drying, the roots are gathered into sacks, ready for the employer's agent.

Following transportation to central barracks, the harvest is taken to import centers, where the roots are sorted, cleaned, and packed. In the rich Mato Grosso district of Brazil, 80 percent of the production is in the vicinity of Barra dos Bugres. The harvest is hauled to Barra dos Bugres by mule or oxcart, and then goes by motor to Caceres. Here the entire region's production is brought together and shipped to Porto Esperanca by boat, and then to São Paulo by rail.

At the present time ipecac is shipped in bales to other countries for processing into emetine, and so takes its place among the many other gifts of the Americas.

HAITI

Almost due south of New York City the island of Hispaniola lies in the Caribbean, shaped like a lobster claw. The western third of this claw—the pincers—is the Republic of Haiti, seemingly reaching toward Cuba.

Roughly, the country may be divided into the mainland and the two peninsulas extending westward, the longer of them in the south. Port-au-Prince, the capital, is the principal city; other centers of population, all of them on the coast, are Cap-Haitien, Gonaïves, St. Marc, and Jacmel.

Of Haiti's area of about 10,700 square miles, which includes several small dependent islands, four-fifths is rugged country, rising in places to almost 10,000 feet. The name, Haiti, comes from an indigenous word meaning "mountainous." Three principal ranges divide the country, and these ranges are interspersed with plateaus and flanked by valleys of varying sizes. The most important plains are the Artibonite, in the northern coast section of the Gulf des Gonaïves, and the Cul-de-Sac extending inward from Port-au-Prince on the southern part of the Gulf. Because of the predominance of limestone soils, high in organic matter, Haiti is remarkably fertile; but erosion of the soil must be checked before long to insure a continuance of this fertility.

The Climate

Haiti is tropical, with a temperature range in the coastal areas of 70° to 87° F. the year round. Temperatures in the mountain areas are somewhat lower, but frost is unknown. The rainfall pattern of the country is irregular, some regions being subject to drought and others more than adequately watered. In general, there are, on the plains and hillsides, two rainy seasons: April-June and September-November. Some parts of the country now arid could be irrigated.

The People

It is estimated that there are from 2.7 to 3 million people in Haiti—one of the highest population densities in this hemisphere. Only about 5 percent of the people live in the cities. The balance live on small farms, raising subsistence crops and bartering for what they need. Those who live near the cities operate truck gardens and sell their produce in the market places and on the streets.

Haitians know democracy well, having fought fiercely for their freedom in the past century. Theirs is the only Latin-American republic whose official language is French.

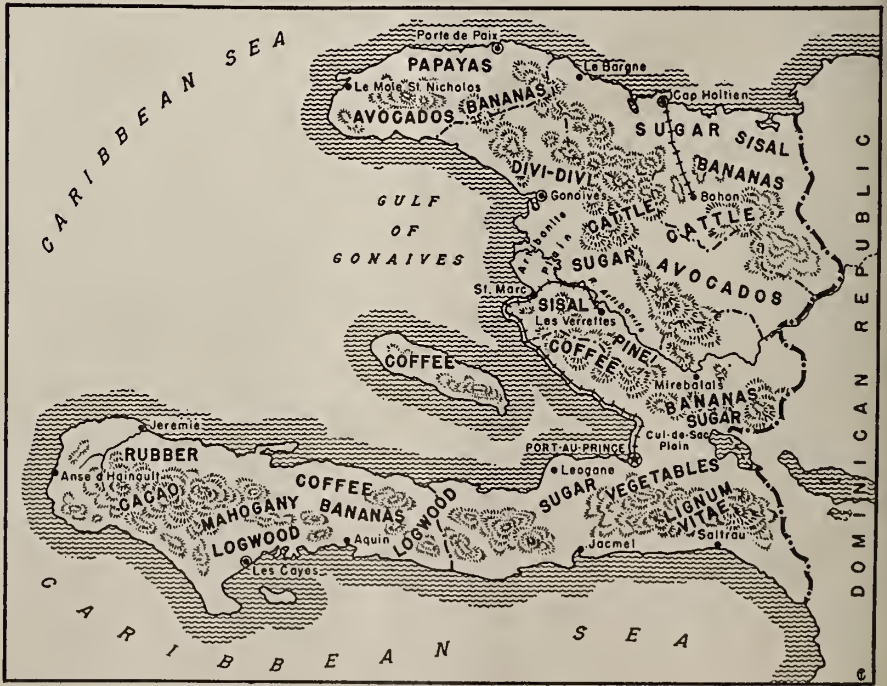
Agriculture

While Haiti's agriculture is carried on by hundreds of thousands of farmers who till small holdings, largely for the benefit of their own families, the Republic as a whole falls into a general pattern of tropical production. Chief agricultural exports are coffee, rice, bananas, sugar and molasses, and cacao. Haitian coffee, which grows almost wild, is reputed to have an especially fine flavor. Rice production has flourished under government guidance in the past decade so that Haiti has become a rice-exporting rather than an importing nation. Bananas have found a ready market in the United States, and this industry will doubtless re-expand after the war.

In addition, Haiti is currently engaged in the production of two industrial crops: rubber (mainly from cryptostegia) and sisal.

Produced for domestic consumption are corn, livestock, beans, plantains, yams, fruits, and coconuts. Wheat flour is the main food import, but all foodstuffs imported before the war amounted to only about 50 cents worth per capita yearly.

Haiti produces quantities of mahogany, lignum vitae, and logwood, though exports of these woods have in recent years been relatively unimportant. Palm-leaf braid is produced for domestic use and for export; and there is some local utilization of pine in the manufacture of charcoal.



U. S. GOVERNMENT PRINTING OFFICE: 1944

52A
2

Agriculture in the Americas

Issued Monthly by the OFFICE OF FOREIGN AGRICULTURAL RELATIONS
UNITED STATES DEPARTMENT OF AGRICULTURE

IN THIS ISSUE

PAGE
Latin America Produces More Rice 143
The Canal Zone Experiment Gardens 146
For Better Living in Brazil 148
Science's Fight for Healthy Hevea 151
Training Farmers for São Paulo 154
Along the Agricultural Front 157
Gifts of the Americas—Mahogany 159

August 1944

LIBRARY
CURRENT SERIAL RECORD
AUG 21 1944
U. S. DEPARTMENT OF AGRICULTURE

NAMES & NEWS

Attend Mexico City Meeting

Secretary of Agriculture, *Claude R. Wickard; L. A. Wheeler,* Director, *Ross E. Moore,* Assistant Director, *John J. Haggerty,* Agricultural Economist, of the Office of Foreign Agricultural Relations; and Eugene C. Auchter, Administrator of Agricultural Research Administration, attended the meetings of the Mexican-United States Agricultural Commission which were held in Mexico City from July 4 to 8.

The purpose of the Commission is to promote the development of agriculture in Mexico and the United States along lines mutually advantageous to the two countries, with emphasis on normal collaborative activities taking into consideration the effect of wartime measures.

●

Goes to Tingo María

Olen E. Leonard, extension specialist in the Office of Foreign Agricultural Relations, has been assigned to the Peruvian-United States Experiment Station at Tingo María, Peru, where he will carry on rural organizational studies and be in charge of the extension program of the station. Under the extension program Mr. Leonard will be responsible for planning and developing specific projects and executing a program of education and service for the farmers of Peru, with special emphasis upon strategic complementary crops.

●

To Study Rubber Leaf Blight

M. H. Langford, plant pathologist for the USDA's Bureau of Plant Industry, Soils and Agricultural Engineering, has gone to Brazil to conduct a series of studies on South American leaf blight of hevea rubbertree. He has already spent a number of years working on this problem in Central America and will continue his studies in the Amazon Valley, which is the natural habitat of the rubbertree.

Dr. Langford has been assigned to work in cooperation with the *Instituto Agronômico do Norte* at Belém, where he will conduct blight-resistance studies on a large collection of hevea clones at the Institute. He will also investigate the possibility of occurrences of specialized strains of the fungus in those areas where the rubbertree grows in the wild state..

●

Geographer From Brazil

Christova Leite de Castro, executive director of the National Council of Geography of the Government of Brazil, is in the United States at the invitation of the United States Department of State to act as visiting Consultant on Brazilian Geography at the Hispanic Foundation of the Library of Congress.

Another purpose of his trip is to discuss with geographers the second consultation of the Committee on Cartography of the Pan American Institute of Geography and History which will be held at Rio de Janeiro in August.

During his stay in the United States Dr. Leite de Castro will visit various geographical centers and manufacturers of geographical materials for the purpose of acquiring maps, instruments, and other equipment for his country.

●

Visiting Latin American Libraries

Carl H. Milam, executive secretary of the American Library Association, and *Harry M. Lydenberg,* director of its international activities, left recently on a 2-month tour of a number of Latin American libraries. The purpose of the trip is to increase the effectiveness of the relations between the libraries of the United States and those of Latin American countries. They will also observe what use is being made of the publications sent to Latin America by the Books-For-Latin-America Project, which is sponsored by the American Library Association of Chicago. In addition, they hope to secure information on the special fields of interest, collections, organization, and services of Latin American libraries. Their itinerary includes Mexico City, Managua, Lima, Santiago, Buenos Aires, Montevideo, São Paulo, and other cities.

Agriculture IN THE *Americas*

Vol. IV · AUGUST 1944 · *No. 8*

Latin America Produces More Rice

During the past two decades several Latin American countries have increased rice production to the point of self-sufficiency; others have changed from importers to exporters. In this article the author discusses trends in rice consumption and production.

by **FRED J. ROSSITER**

Rice, the basic food in most Oriental countries, appears to be gaining importance rapidly in the diet of people living south of the Río Grande. Total rice utilization in Latin American countries during the past two decades has increased approximately 50 percent. Part of this increase in consumption is attributable, of course, to a larger population, but per capita rice consumption also has increased markedly in several Latin American countries.

As a result of production expanding more rapidly than consumption during the past 20 years, the Western Hemisphere has changed from a net importer of rice to a net exporter. In 1925 this hemisphere was a net importer of rice by about 1,000 million pounds. In 1942 it became a net exporter for the first time, and by 1944 the surplus may amount to 500 million pounds.

One wonders whether it is possible that only the older civilizations have learned that rice is a practical and economical food. No doubt many Latin Americans are finding, as the Orientals have known for a long time, that rice is

In rice harvesting by hand in Ecuador large bundles are cut with machetes and spread on the ground to dry before they are threshed. Laborer in the left foreground is beating out the dry rice on a cloth which has been spread over the ground for that purpose.

Chile has built several modern rice mills in the development of its rice industry during the past 10 years.

a food easily prepared, requires but little household equipment for preparation, and is high in food value.

Some nutrition experts may claim that the increased consumption of rice indicates an improved standard of living. Others will not agree with this point of view. But any conclusion in this connection must consider the living standard of the country or area concerned. The Chinese farmer or merchant, for instance, who can afford rice three times a day considers he has a high standard of living. In other parts of the world a family might afford all the rice it could possibly consume but would not be maintaining even a fair standard of living.

The sharp upward trend in rice consumption might imply that rice is replacing corn in the diet of the people in some Latin American countries. For most areas data are inadequate to prove that human consumption of corn is decreasing, or rice increasing. Indications are, however, that this is the case in Colombia, Ecuador, Peru, and some Central American countries.

Greatest Consumption in Tropics

The greatest per capita consumption of rice in this hemisphere occurs in the tropics. Surinam, with an annual per capita consumption of about 230 pounds, apparently has the highest per capita consumption. Puerto Ricans and Cubans are also heavy consumers of rice, with a per capita utilization ranging from 105 to 125 pounds per year. The inhabitants of some of the British West Indies and Guadeloupe were heavy consumers of rice prior to the war.

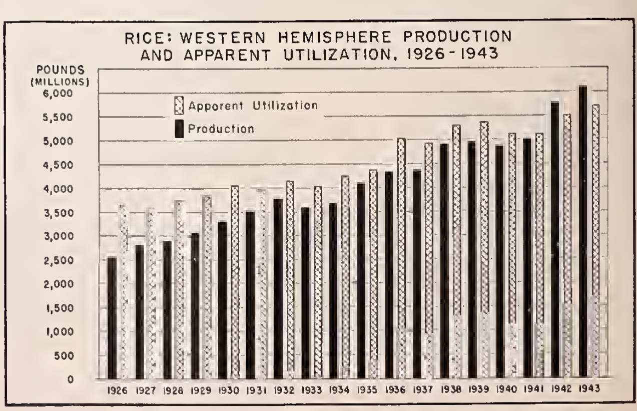
In most of Central America, especially in Panama, Costa Rica, British Honduras, and Nicaragua, rice consumption is fairly heavy. In South America, Brazil has the heaviest per capita disappearance of rice, amounting to about 40 pounds a year. Peru, Ecuador, and Colombia follow with about 25 pounds a year. Argentina, Uruguay, and Chile are lowest in South America, with about 10 pounds a year for each person. This is in contrast to about 5 pounds a year for Canadians and 6 pounds in the United States. Although the per capita consumption of rice in the Western Hemisphere may be increasing, it is still relatively small in comparison with such countries as Japan, Siam, and Burma, where the per capita consumption averages over 300 pounds a year.

While the increase in consumption of rice in the Western Hemisphere has been remarkable, production has risen even more sharply. Practically every country has expanded its production of this crop. Although the Western Hemisphere produces only a little over 2 percent of the total world production, every country in the hemisphere, with the exception of Canada, grows rice. Production, during the past two decades, has increased over 100 percent. The expansion has been steadily upward during this period, with only a slight dip during the deep-depression years. The outbreak of the war in the Pacific, suddenly cutting off Asiatic rice supplies from the Western Hemisphere and European countries, accelerated further expansion. The realization of an Allied-Nation shortage of rice, accompanied by rising prices, has stimulated not only private interests but governments of several countries to increase rice production.

Brazil and the United States are the two giants among rice-producing countries in this hemisphere and account for about 75 percent of the total production. Both countries have been growing rice for a long time and both have expanded rapidly during the past 8 years, especially since Pearl Harbor. Other Latin American countries which have rapidly expanded production and are now producing more than 100 million pounds yearly, in order of importance, are Colombia, Ecuador, Peru, Chile, Argentina, Mexico, the Dominican Republic, and, more recently, Panama.

Trade Shows Changes

Because of this phenomenal expansion in production during the past two decades, some remarkable changes have occurred in the rice trade of several Latin American



The author is a member of the Office of Foreign Agricultural Relations and for many years was stationed in the Orient. For the past 8 years he has closely followed world rice production and international trade.

countries. Argentina, for example, imported an average of over 140 million pounds annually from 1926 to 1930, while during the past 2 years that country has been practically self-sufficient. During this period production expanded from 11 million to 192 million pounds. Chile, 15 years ago, had not learned the art of growing rice but was importing annually over 45 million pounds. Current reports indicate that the 1944 crop will amount to more than 200 million pounds and that Chile will probably have available for export to foreign countries from 50 to 80 million pounds. The Dominican Republic has achieved a considerable shift in rice production and trade. From 1926 to 1930 that country imported an average of 57 million pounds of rice a year, while during the past 2 years net exports have averaged about 15 million pounds. During this period production expanded from about 16 million to over 150 million pounds. Several Central American countries also have changed from a net importing to a net exporting basis during this period.

Two decades ago only three out of the twenty Latin American countries were considered exporters of rice: Brazil, Ecuador, and Mexico. The other seventeen were considered net importers. By 1944 the picture has changed materially. Today only five Latin American countries—Cuba, Bolivia, Peru, Venezuela, and Honduras—import rice each year.

One wonders how long the Latin American countries will continue to increase rice production and consumption. Any forecast would be pure speculation. It is reasonable to expect, however, that production will continue to expand as long as farmers are able to sell their harvests at a profit. The belief is that this will continue to be possible for some months after the surplus areas of the Far East are liberated. When Burma, Thailand, and French Indo-China again begin shipping rice to the world markets, expectations are that the Western Hemisphere exporting countries will encounter very keen competition. With the Western Hemisphere now having a surplus of 500 million pounds for shipment to Europe, Africa, and Asia, there is a likelihood that these markets will eventually be lost and that it will be necessary to reduce production in this hemisphere by at least this amount. Moreover, the probability exists that in a few years low-priced Asiatic rice may again find its way into some of the importing areas of the Caribbean.

Before hulling and cleaning in the mill the bags of rice are spread in patios for complete drying in the sun.

In Southern Brazil earthen dams are being constructed to provide water for rice irrigation.

The present consumption of rice in the Western Hemisphere will very likely be maintained and will probably continue to increase in countries where corn and other coarse cereals make up a large percentage of the diet. Despite any increase in consumption, however, it seems logical to believe that after the war in the Far East is terminated some of the surplus-producing countries in the Western Hemisphere will be unable to find a market for their entire production and will need to reduce their rice acreage.

Improved cultural practices are being developed in some Western Hemisphere countries. Some post-war planners may visualize that with a reduction in the cost of production this hemisphere will be able to compete with Oriental rice in some world markets. An examination of the cultural practices used in various countries shows that the United States has the most highly mechanized methods of growing and harvesting rice. The most modern cultural practices are employed by rice producers in California, where seeding the fields is frequently done by airplane and practically all harvesting is by tractor-drawn combines.

In the Southern States, preparing the land and seeding are similar to that for other grains in this country. After the crop is planted, the fields are irrigated and water is kept on the land until the grain begins to ripen. Then the fields are permitted to dry so that harvesting equipment can be used. In the Southern States the combine harvester is gradually replacing the binder and the threshing machine.

In some Latin American countries, particularly Argentina, and to some extent in Chile, southern Brazil, Mexico, and the Dominican Republic, modern machinery is used in the production of rice. In most countries, however, relatively small-scale equipment is utilized, requiring a large

(Continued on page 158)

The Canal Zone Experiment Gardens

The supplying of seeds and seedlings for rubber production, a tough grass for drill grounds and airfields, and termite-resistant teakwood for naval craft construction are among the war services being performed by the Canal Zone Experiment Gardens.

by E. C. HIGBEE

Located at the crossroads of the hemisphere, the Canal Zone Experiment Gardens at Summit on the Isthmus of Panama have pioneered for 20 years in the collection and dissemination of improved agricultural and horticultural plant varieties for the American tropics.

Founded in 1923 by the Panama Canal for the purpose of assisting farmers in the Zone, their influence has long since been appreciatively received by agricultural agencies and planters throughout the hemisphere's tropics, particularly in Panama.

Over the beautifully landscaped area of 125 acres have been distributed some 10,000 different plant species obtained from every tropical region of the world. These have been collected by expeditions of the Station's own personnel and by contributors of other countries. Some of the finest specimens were obtained for the Gardens by the expeditions of Allison V. Armour and Dr. David Fairchild. These, together with contributions from the world-wide accessions of the U. S. Department of Agriculture, have made the Summit tropical plant collection one of the most complete of its kind.

This extensive arboretum, its roads and paths lined with magnificent palms, bamboos, and flowering trees, is the most attractive park and outing ground on the isthmus. Its principal purpose, however, is to test the adaptability of these introduced plants to the Canal Zone and, incidentally, to comparative areas of the American tropics. Today the activities of the Gardens are mostly confined to wartime projects. Officers and enlisted men preparing for jungle warfare have taken courses at the Gardens to acquaint themselves with both the poisonous and edible plants to be found in local and Far Eastern jungles.

One of the attractively shaded driveways through the Canal Zone Experiment Gardens at Summit on the Isthmus of Panama.

Nursery Work Expanded

The vast building program undertaken in recent years in the Canal Zone has necessitated much landscape and nursery work. In 1943 alone the Experiment Gardens performed over half a million dollars worth of nursery and landscape service. Early experiments at Summit with introductions of Java grass solved an important wartime problem of how to rapidly establish a tough grass cover for hundreds of acres of newly constructed drill grounds, highway shoulders, and plots between the landing strips of air fields.

With the Japanese occupation of the Philippines, the United Nations lost their chief source of abacá or Manila hemp, the only satisfactory, tough, salt-water-resistant

---

The author is a member of the staff of the Office of Foreign Agricultural Relations and has spent much time in South America in the interest of increasing the use of insecticides, particularly rotenone and barbasco. Another article by Mr. Higbee, "Lagunas—Barbasco Capital of the World," appeared in the May issue of AGRICULTURE IN THE AMERICAS.

Director Walter R. Lindsay stands in front of the Administration Building of the Experiment Gardens.

marine cordage fiber. In the early 1920's the Summit Experiment Gardens cooperated with the U. S. Department of Agriculture to introduce abacá to the Americas. The success of this project laid the ground work for today's vital wartime abacá production in the Western Hemisphere. [See January 1944 issue of AGRICULTURE IN THE AMERICAS.]

At the present time nearly every country in the American tropics is engaged, with United States aid, in the promotion of plantation rubber projects. Although hevea rubber is a Western Hemisphere native, until recently only the Ford Motor Company in Brazil and the Goodyear Rubber Company in Panama and Costa Rica have attempted to establish the crop on a plantation basis in the Americas. Goodyear's first venture in Panama in 1935 was stimulated by the earlier plantings at the Summit Experiment Gardens which were made in 1923. Sixty thousand seedlings for planting the Goodyear All-Weather Estate on Lake Gatun were raised in Summit's nursery beds. A half million rubber seeds have been supplied to rubber nurseries in Colombia, Ecuador, and Venezuela in the last few years.

Practical Field Trials Undertaken

The problem of providing fresh milk to thousands of workmen and their families has always been a matter of consideration on the part of the Panama Canal authorities. The introduction of and successful field trials by the Experiment Gardens with African Napier grass solved an important roughage question for the Zone's model Mindi dairy farm, which boasts more than a thousand head of cattle. Despite wartime shortages of certain imported concentrates the Mindi dairy herd is making an outstanding record for the tropics.

Notable among Summit's contributions to agricultural progress in tropical America has been its plant distribution service. Every year it is solicited by individuals and government agencies of nearly all the countries of the hemisphere for plants, seeds, and technical information. In this respect, because of location, its reciprocal relations with Panama have always been outstanding.

For many years the Gardens have assisted sugar growers in Panama who, at one time, were threatened with bankruptcy because of mosaic disease. This situation was largely averted by the introduction of mosaic-resistant strains from the Experiment Gardens. Now Panamanian planters are most concerned with adopting a higher sucrose-producing variety of cane which will withstand the prolonged dry season of the Pacific coast growing areas without excessive loss of sugar content. With the help of a resident pathologist of the U. S. Department of Agriculture, Summit is at work supplying the answer. The Gardens' sugarcane collection contains nearly all the world's known commercial varieties as well as numerous wild strains useful for breeding purposes. Among these hundreds of types is one which Columbus brought to America on his voyage of discovery.

For 10 years the Gardens have experimented with teak. This rapid-growing, termite-resistant, straight-trunked tree produces a high quality lumber which is easily milled and is important for certain naval-craft construction. The United Fruit Company in Honduras has planted teak on abandoned banana plantation lands. Other interested parties in Guatemala and Costa Rica have recently requested teak seeds from the Gardens. The success of teak at Summit has indicated how a profitable forest industry could be established on the cut-over waste lands of the Canal Zone where there is always a local need for termite-resistant lumber.

Recently in cooperation with the U. S. Department of Agriculture and the Inter-American Institute of Agricultural Sciences, Summit acquired a collection of high-quality derris clones. The roots of this plant contain the insecticide rotenone and the crop promises to be of considerable economic importance in the future to the Western Hemisphere as it has been in the past to the Far East.

Bean-production experiments are among the many hundreds that are being carried on at Summit.

Plant specialists at Summit have made many contributions to fruit and vegetable growers in the Zone. To test

(Continued on page 156)

For Better Living in Brazil

Recognizing that better diets are a universal need, Brazil recently took a significant step in the training of 51 young women for practical nutrition work. This article discusses the training course and how these young women are being effectively placed.

by **JUNE LEITH NORDIN**

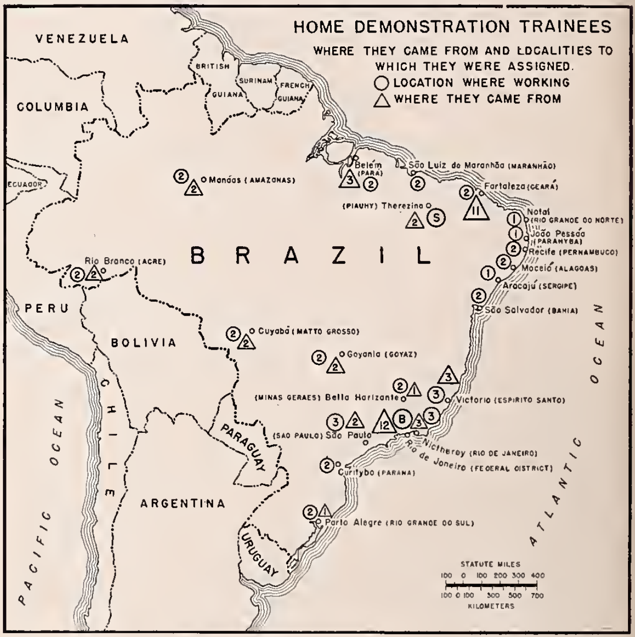
In August 1943 I went to the airport at Rio de Janeiro at least once a day for a week to meet one or more prospective nutritionists from widely scattered places in Brazil. Laura came from the State of Espirito Santo, Iracema from Amazonas, Carmela and Stella from Rio Grande do Sul—to name a few of the representative young women who had been carefully selected for their ability and desire to help the people of their great country.

Although I had lived in Rio for a number of years and counted Brazilian girls among my best friends, I had misgivings about meeting so large a group of young women from all over such a large country. Their arrival, however, was a pleasant surprise. Naturally, their speech, appearance, and ideas varied, but they were all attractive girls who had come to Rio with a purpose—to learn all they could about practical nutrition. After obtaining this knowledge they intended to return to their home State or community and apply it toward health improvement.

Food Situation Was Acute

The reason for their studying this vital phase of human welfare dates back to September 1942. Defense measures had caused an influx of both Brazilian and United States military personnel to northern Brazil. Concurrently, there was a sharp increase in the civilian personnel in this area to service the military, to collect rubber from the Amazon, and to get out certain strategic minerals. This rapid increase in population would have strained the food resources of any area. The problem was particularly acute in northern Brazil, where food imports are normally relied upon to supply the local needs. Since fewer than normal transportation facilities were available at this particular time, the most logical solution to the problem seemed to be to produce food in the area where it was needed.

To get this vital food production program under way, the Brazilian-American Food Production Commission was organized through the Brazilian Department of Agriculture and the Food Supply Division of the Office of the Coordinator of Inter-American Affairs. A group of agricultural technicians from the United States went to Brazil to work with some 2,000 Brazilians already on the job under Dr. Kenneth J. Kadow and Dr. Oscar E. Guedes. Of the North American group, 18 in number, all except me were agriculturists and engineers.



Education Program Started

The Commission had not been operating long before the need became apparent for not only greater and more efficient production but also better use of the existing food supply through knowledge about nutrition. Several Brazilian institutions, both governmental and private, had previously undertaken a certain amount of nutrition education. Of these, the *Serviço de Alimentação da Previdência Social* (Social Welfare Feeding Service), now generally identified as SAPS, showed best promise of successfully expanding its nutrition education program. Dr. Edison Cavalcanti, director of SAPS, was eager to cooperate with the Brazilian-American Food Production Commission. As a result,

---

Before accepting the position of nutritionist with the Brazilian Field Party of the Food Supply Division, Office of the Coordinator of Inter-American Affairs, Mrs. Nordin had lived in Brazil for several years. She attended school there and, after obtaining collegiate and graduate training in the United States, returned to Brazil as a teacher of foods, dietetics, and meal planning.

a 6-month course of instruction was organized in Rio de Janeiro.

Each of the 21 States of Brazil was asked to submit the names of two young women for the training course to a selection committee in Rio, where the final choice was made. These girls came to Rio at the expense of the Commission, which also agreed to furnish books, uniforms, and a monthly living allowance. SAPS was responsible for providing the actual instruction. Before starting her course of instruction each girl agreed to accept, at the end of the training period, employment by the Commission or SAPS in her home State for a minimum period of two years if either of these organizations should need her services.

What was the course of instruction? Nutrition was taught by Dr. Glauco Correia, a physician who had specialized in nutrition; dietetics was presented by Dr. Dante Costa, also a physician and a leading nutrition specialist who, incidentally, has translated into Portuguese the 1940 edition of McCollum's *Newer Knowledge of Nutrition*; the hygiene teacher was Dr. Jorge Bandeira de Mello, professor of hygiene in the College of Medicine of the University of Brazil and a member of the Public Health Service; social service was taught by Dr. Mancini, an outstanding Brazilian sociologist; the course in food preparation was my responsibility with the assistance of two young women, Liselotti Hoeschl, teacher of food preparation and dietetics at the Ana Nery Nursing School, and Dylma Severo Martins, now a teacher of foods at Colégio Bennett in Rio.

Practical Course Needed

One of our primary objectives was to make this course as practical as possible. Accordingly, class work was supplemented with visits to homes under the direction of the sociology teacher, and with laboratory work in the nutrition and dietetics courses. The major part of the work on food preparation was carried out in the foods laboratory of SAPS. Toward the conclusion of the course each girl made a series of visits with the home workers employed by the Technical Section of SAPS to offer advice to housewives concerning what foods to buy and how best to prepare them.

In addition to the young women whose training was financed jointly by SAPS and the Brazilian-American Food Production Commission, several others received instruction free, the rest of the expense being paid either by the student or by other Brazilian organizations, namely, the *Legião Brasileira de Assistência* and the Special Public Health Service. A total of 51 girls completed the course on February 26, 1944.

Well ahead of the graduation of this class careful consideration was being given to the placing of these young women where their training would be of greatest advantage to Brazil. SAPS and the Commission employed 26 of them.

Baking powder cans, graduated with standard culinary measurements, are used as measuring cups in the Foods Laboratory.

Dr. Edison Cavalcanti, Director of the SAPS ***(Serviço de Alimentacão da Previdência Social)*** **surrounded by faculty and students of the nutrition course following the graduation ceremony.**

Although nutrition work had made some headway in Brazil it was not extensive enough to absorb the remaining 25 workers at once. Therefore, acting more or less as an employment agency, we embarked upon the task of pointing out to institutions and State officials the need for one or more nutrition aides. With our help in planning new jobs, this was not too difficult, particularly in those instances where the State officials concerned were the same ones who had originally suggested the young women for training.

The special Public Health Service employed seven of the girls, three of whom went as nutritionists to their home States in the north—Acre, Amazonas, and Pará—to work at out-of-the-way medical posts in the Amazon Valley; three were employed as staff nutritionists in their Nurses Training Program; and one, who is also a trained nurse, is serving as a combination visiting nurse and nutritionist in the Vale do Rio Doce, a vast mining area in the State of Espirito Santo.

Trainees Widely Scattered

The trainees are now to be found working in almost every State of Brazil. Two were appointed as superintendents of child-feeding centers in the State of Goiaz, and to better prepare them for this work the Commission arranged for them to stay in Rio an additional 2 weeks for extra training as apprentices in the Children's Bureau. Another girl will take care of the feeding service in a day nursery in the hinterland Territory of Acre, and another, a former primary school teacher, will supervise the school lunch program in Minas Gerais. An outstanding student with 10 years' experience in sanitary education was chosen to take over the work of the nutritionist in Belém when the regular nutritionist there came to the United States on a travel-study grant. In this position she is responsible for the proper feeding of from 1,000 to 2,000 rubber workers daily in the camp for migrant workers on their way up the Amazon. Still another is supervising the dormitory food service in a private school in Rio de Janeiro.

Four are employed as nutrition home visitors in their home States. We drew up a program for them to follow at the request of the State institutions employing them. Two others have been put in charge of food services in hospitals, there being no hospital dietitians as such in Brazil at the present time. One other girl stayed in Rio for a more advanced nutrition course which is being organized by SAPS, the first of its kind in Brazil.

Of the girls whom SAPS employed upon graduation, 10 are working in its Home Visiting Service in the girls' home States and in Rio de Janeiro. They work in connection with the low-price grocery stores and restaurants that are supervised by SAPS, going into the homes of patrons to help them with their food problems.

To Establish New Training School

The 11 young women employed by the Brazilian-American Food Production Commission are staying on in Rio for a 5- to 8-month period of advanced training and field work in teaching, home visiting, organization and direction of home economics clubs, observation and experience

(Continued on page 156)

Science's Fight for Healthy Hevea

One of the toughest battles that plant scientists have had to wage in recent years has been against the South American leaf blight—the major foe of the Para rubbertree.

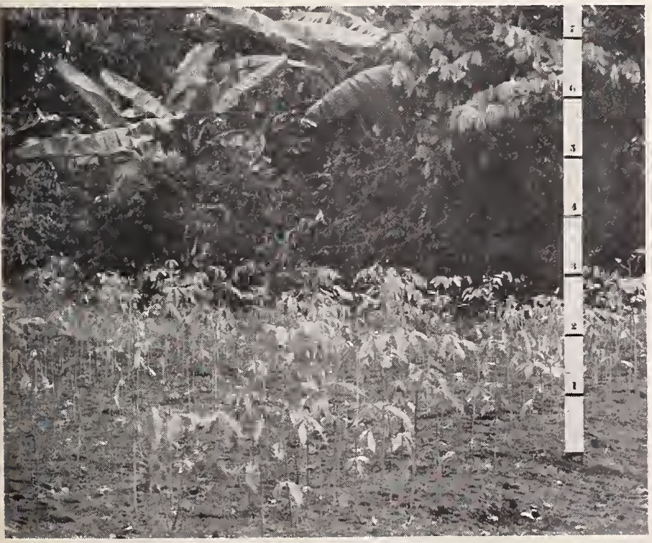
by **M. H. LANGFORD**

During the past few decades, plant scientists have discovered effective means of controlling most major diseases of important Temperate Zone crops of the Western Hemisphere. Diseases of many tropical American crops, however, have received relatively little attention, and heavy losses have been the result. In some cases attempts to grow crops in areas where soil and climate are admirably suited for their culture have been thwarted almost completely because of the ravages of disease. An example of this is the battle which has been waged against the parasitic fungus *Dothidella ulei,* which is the causative agent of the Para rubbertree's deadly enemy, the South American leaf blight.

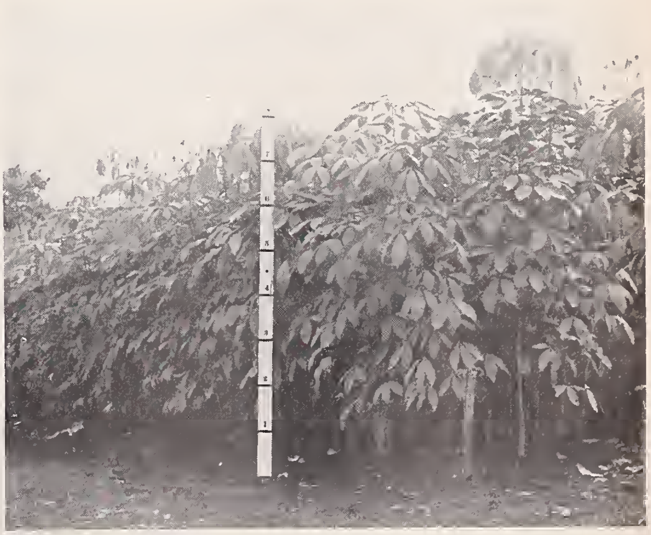
The Para rubbertree (*Hevea brasiliensis*) is a native of South America. The hevea tree and South American leaf blight have lived together peacefully in the jungles for centuries. This circumstance prevailed because jungle conditions prevented the parasite from multiplying and spreading rapidly enough to overwhelm the host plant. Wild hevea trees in the jungles do not occur in dense stands, and usually there are not more than half a dozen trees per acre. Each hevea tree is screened from its neighbors by the foilage of trees of other genera, and, as these other trees are not susceptible to leaf blight, they serve as barriers to the passage of spores from one hevea tree to another. By virtue of this, disease damage to wild hevea trees is moderate. South American leaf blight, therefore, remained an obscure disease throughout the period when rubber from wild trees of the Amazon Valley dominated world rubber markets.

Leaf blight has not plagued the extensive rubber-growing industry of Southeastern Asia because the disease was left behind when the hevea plant was introduced into the Orient. Subsequently, the great distance over which windborne spores would have to be carried, together with strict quarantine precautions, has kept this area free of leaf blight. Absence of leaf blight, therefore, is due to absence of the fungus parasite rather than to resistant trees or unfavorable weather conditions for disease development.

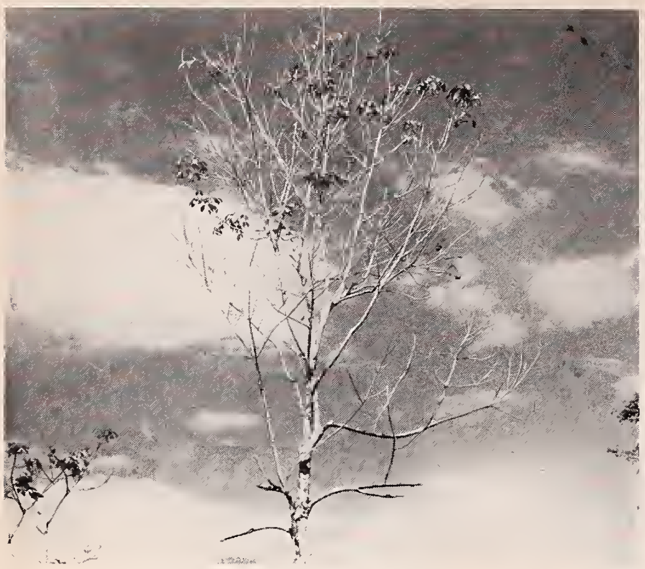
Soon after the rise of the Oriental rubber-growing industry demonstrated that rubber from wild trees could not compete with plantation rubber, many attempts were made to grow rubber on plantations in tropical America. Leaf blight soon spread from scattered wild trees to most of these plantings and, almost invariably, it eventually reached epidemic proportions. The favorable conditions for blight development and spread provided by dense plantings



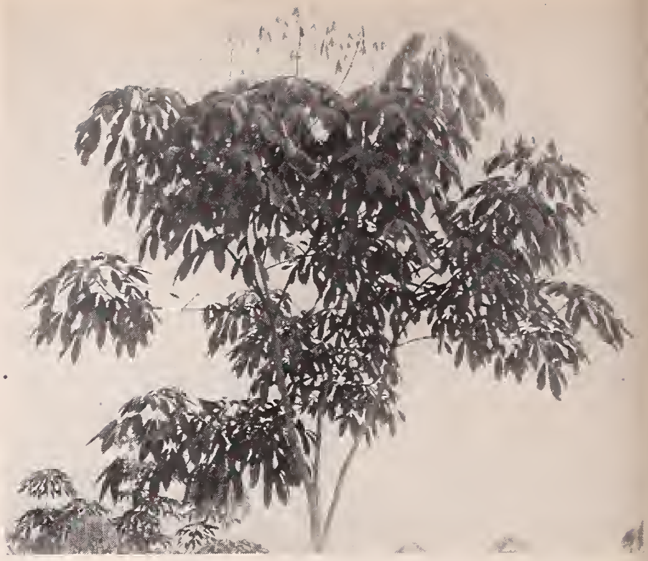
Spraying of hevea gave convincing results. This is one of the unsprayed seedling plots.



A nearby plot of sprayed seedlings. Both beds of seedlings are 1 year old.



A susceptible 5-year-old hevea tree that has been repeatedly defoliated by leaf blight.



A blight-resistant 3-year-old hevea tree with spotless foliage.

resulted in leaf blight attacks severe enough to cause repeated defoliation of the trees. This caused depletion of starch reserves and eventually killed the trees. In British and Dutch Guiana and Trinidad, thousands of acres of hevea rubbertrees were destroyed by leaf blight from 1910 to 1920, and more recently rubber-growing enterprises in Brazil, Costa Rica, and Panama have been seriously handicapped by the ravages of the disease.

Program Started in 1940

The first opportunity for a concentrated attack against leaf blight came when a cooperative program of rubber investigations was launched by the United States Department of Agriculture, several commercial companies, and 14 Latin American countries in 1940. Under terms of the agreement, the Department of Agriculture stationed plant scientists in tropical America to conduct investigations of problems associated with hevea rubber culture.

Leaf blight was recognized from the beginning as hevea enemy Number One, and two simultaneous attacks were launched against the disease. The first was merely a holding attack and involved the use of fungicidal sprays. The second and main attack was concerned with disease control by selection of highly resistant clones. The program as a whole was based on the belief that blight-susceptible seedlings could be protected with fungicidal sprays until they have reached budding size; then they would be budded with blight-resistant clones. Somewhat later, the procedure of spraying high-yielding, blight-susceptible clones until they reach top-budding size was inaugurated.

High-yielding hevea clones, like many varieties of trees that produce high-quality fruits, are propagated by grafting their buds on 1-year-old seedling plants. Thus, a young hevea tree commonly consists of a seedling root stock with the above-ground part of the plant growing from a bud patch grafted near the ground line. In the temporary absence of clones that combine the highest yield with high blight resistance the budding process may be carried one step further. The seedling may be budded with a high-yielding, blight-susceptible clone, which in turn is top-budded with a blight-resistant clone at a height of approximately 6 feet. This procedure is feasible because the yield of a tree is determined largely by the trunk or tapping-panel clone. The double-budding operation offers a real advantage because it permits selection of the tapping-panel clone almost solely on the basis of yield, whereas the top-budding clone may be chosen on the basis of resistance to wind and pests.

Although several earlier spraying experiments had been reported to be failures, equipment and materials for a thorough investigation of the subject of fungicidal control of leaf blight were assembled soon after the program of rubber investigations was launched in July 1940. In October of that year spraying and dusting experiments were started in young seedling nurseries on the Goodyear Rubber Plantation in Panama. During previous years more than 90 percent of the seedlings planted in some of the nurseries there had been destroyed by leaf blight.

New Organic Fungicides Used

In addition to the time-tested copper and sulfur fungicides, a variety of new organic fungicides were used in the spraying experiments in Panama. In view of the waxy nature of hevea foliage and the frequency of tropical rains, tests were run in which various spreaders and stickers were added to the spray mixtures. In this role rosin, casein, flour, oils, and a number of proprietary products were tested.

Bordeaux mixture, prepared according to a number of formulae, was used in the first spraying tests. It gave excellent blight control but often injured very young plants. High-lime Bordeaux caused more injury than low-lime Bordeaux. The "insoluble" copper fungicides, proprietary products sold under a number of trade names, gave excellent disease control without injuring young plants.

Lime-sulfur, when used at concentrations high enough to control the disease, burned hevea leaves during periods of bright hot weather. Colloidal and dry-wettable sulfurs caused little or no damage to hevea foliage but were less effective than "insoluble" copper fungicides in controlling leaf blight. Some of the organic fungicides were less effective than colloidal sulfur, whereas others were almost as effective as the "insoluble" copper fungicides.

Spreaders and stickers generally improved disease control, but the oils caused severe stunting of plant growth. Rosin and casein preparations gave especially promising results.

Both copper and sulfur dusts gave partial disease control. The degree of control, however, was less than that obtained by spraying with similar fungicides.

The spraying tests in Panama were conducted under hot moist conditions that induced constant emergence of young susceptible foliage and frequent infection periods for leaf blight. This allowed little opportunity for unprotected plants to escape the disease; therefore, the results of these tests were soon quite obvious, and they have proved to be very reliable. Subsequently, spray mixtures containing 2 pounds of "insoluble" copper fungicide and a small amount of spreader and sticker per 100 gallons of water have been used to protect millions of disease-susceptible seedlings growing in nurseries extending from Costa Rica to Brazil and Peru. Two to four spray applications per month have effectively controlled leaf blight in this wide range of localities and under a wide range of climatic conditions.

Success in controlling leaf blight by spraying seedling nurseries encouraged tests in spraying high-yielding, blight-susceptible clones until they have reached top-budding size. After seedlings are budded with blight-susceptible clones, they may be transplanted to the field immediately, or they may be grown under spray in the nursery until they are top-budded. The more desirable procedure will depend upon local conditions, including ability to transplant top-budded stumps successfully.

In many localities young susceptible plants growing at field spacing are not severely attacked by leaf blight during the first year and need no protection from sprays. In other localities three spray applications per month may be necessary. Even with this number of applications spraying is a cheap protection, because only the young susceptible leaves need be sprayed and all spraying is discontinued after the trees are top-budded with resistant clones at the approximate age of 1 year.

Tests with various types of spray equipment have shown that power-driven pumps are most efficient for spraying large nurseries. However, in the case of young plants growing at field spacing, knapsack sprayers have proved to be the most efficient type.

From the beginning, blight control by spraying large plantation trees has not been considered economical. Spraying, however, does have still another practical application in protecting high-yielding, blight-susceptible clones growing in mixtures with highly resistant clones in breeding gardens. The feasibility of preserving valuable breeding trees by spraying with fungicides was demonstrated by tests conducted in Panama.

Disease Resistance Studied

While tests on fungicidal control of leaf blight were being carried on, studies on disease resistance were also under way. This phase of the program was greatly facilitated by the pioneer selection and breeding work of the Ford and Goodyear companies. An intensive search for high-yielding blight-resistant jungle trees was begun, and the program of crossing high-yielding Oriental clones with blight-resistant indigenous selections was augmented by personnel working under the intergovernmental agreements. Of importance also was a study of the means of spread and the behavior of leaf blight. From this evolved a quick

(Continued on page 158)

A blight-resistant hevea seedling growing in a nursery among slightly resistant and susceptible seedlings.

Dr. M. H. Langford is with the U. S. Department of Agriculture's Bureau of Plant Industry, Soils and Agricultural Engineering. He has spent a number of years in Central America working on the South American leaf blight. At the present time he has been assigned to Brazil, where he will continue his work on leaf blight in the Amazon Valley.

Training Farmers for São Paulo

by ROBERT E. BOWLUS

Realizing a distinct need for the education of youths interested in farming as an occupation, the State Government of São Paulo, Brazil, intends to organize ten agricultural schools in the near future. Plans for enlarging the system of agricultural education have been prompted by the outstanding success of the Practical Agricultural School at Jaboticabal, which has been in operation for a number of years.

Five of the ten schools are now actually being built, while plans for the other five are under consideration. Those now under construction are to be ready for use early in the fall of 1944.

In this broadening program of agricultural education in the State, facilities will be made available to train young men to be managers and supervisors of large *fazendas,* as well as independent small farmers. Through this program the State Government also hopes to improve the efficiency of agricultural workers, to improve health conditions, and to raise living standards of rural populations.

Plans are for the ten new establishments to follow the organizational lines of the Practical Agricultural School at Jaboticabal. This school is similar to a junior agricultural college in the United States, and the students would pass for college freshmen or sophomores, being from 15 to 26 years of age. There are about 300 boarding students and nearly 200 day students, about half of whom, upon entering, have little if any educational background. A rather broad agricultural and general educational course is given, requiring 4 years for those who have little educational background and 3 years for others. The students of each year are divided into two groups, one group working in the fields while the other attends classes. No tuition is charged, since the school is a State-supported institution. Students raise all their food and make a number of articles for their wardrobes, including shoes, in the shops.

Administration Building of the Practical Agricultural School at Jaboticabal, São Paulo. The dining hall is located in the basement of the building and the second floor is used for dormitories.

As part of their training, students of the school get practical experience taking care of vegetable gardens.

The curriculum of the school is divided into four parts: General information, animal husbandry, general agriculture, and administrative and technological agriculture. Students take courses in all departments during the 3 or 4 years they are in attendance. In the first year they have courses concerning poultry, dairy cattle, vegetable and fruit production, general agricultural practices, rural industrial arts, and physical education. In addition they take a general course giving some of the elements of arithmetic, language, history, geography of Brazil, rural economy and bookkeeping, drawing, and moral and civic education. The second year, the students take more advanced courses in the same general fields and specialize in some one line, and in the third year they elect courses in general agriculture, zootechny, agricultural industries, agricultural economics, and workshop practice.

The practical farm work performed by the students includes caring for livestock, feeding and milking cows, raising chickens, growing vegetables, ginning cotton, processing coffee, and making butter, granulated sugar, alcohol,

(Continued on page 158)

The author, an agricultural economist in the Office of Foreign Agricultural Relations, based this article largely on a report submitted by Henry W. Spielman of the United States Consulate in São Paulo, Brazil.

Reading about the AMERICAS

The Brazilian-Portuguese Frasograf, by Rosalind Ashe and Albert Avigdor. 200 pp. Frederick Ungar Publishing Co., New York; 1944. This pocket-size phrase book is arranged alphabetically by English key word and illustrated, in parallel columns on the same page, by the corresponding Portuguese colloquial sentences and phrases, idiomatic expressions, and words most commonly used in everyday conversation. Frequently Portuguese equivalents indicate the several meanings of English words. A Portuguese-English index makes it possible to locate the Portuguese key-word equivalents.

Latin America; Its History and Culture, by J. F. Rippy and L. I. Perrigo. 426 pp., illus. Ginn & Company, Boston; 1944. The first 56 pages are in the form of letters written to his classmates by a boy who travels with his uncle to Cuba, Mexico, Central America, and down the west coast and up the east coast of South America. The remainder of the book presents the history of Latin America. The book is divided into units, at the end of each of which are lists: of activities—subjects to discuss, to tell, to define, and to pronounce; and of books to read—all on the subjects covered in the unit. An appendix contains, among other information, a pronouncing list of proper and common Spanish and Portuguese names, a list of periodicals and books for teachers, of folklore, and of audio-visual aids for the study of Latin America.

La Molienda de Trigo en la Argentina, by Ing. Agr. Edmundo J. Billard. 23 pp., tables. Centro Argentino de Ingenieros Agrónomos, Buenos Aires, Argentina; 1943. The author discusses the growth of wheat milling in Argentina and by means of tables and graphs analyzes the recent development of the industry in that country.

Agriculture in Guatemala, by Mariano Pacheco Herrarte, Director General of Agriculture of Guatemala. 36 pp., illus. Division of Agricultural Cooperation, Pan American Union, Washington, D. C.; 1944. The latest addition to the American Agriculture Series. A brief presentation of the characteristics of Guatemala and its agriculture.

Cinchona in the Americas, by Robert W. Richardson. 19 pp. (mimeographed). Research Division, Social and Geographic Unit, Office of the Coordinator of Inter-American Affairs, Washington, D. C.; 1944. A popularly written account of cinchona, source of quinine, in the Americas. After telling various stories of the discovery of quinine, the author explains the geographical distribution of cinchona in Peru and Colombia, the methods of gathering cinchona bark, and the people who carry on the industry.

Catálogo de Produtos do Amazonas. 52 pp., illus. Issued in 1942 by Associacão Comercial do Amazonas, Manaus, Amazonas, Brasil, which maintains at its headquarters a permanent exhibit of the products of this region. This pocket-size book gives a brief account of about 60 of the forest products of Amazonas, under 20 main headings. These include rubber, Brazil nuts, and cacao, as well as less familiar oils, resins, timber, etc. Addresses of exporters of the various products are given.

The Basic Principles of the Inter-American System. Prepared by the Executive Committee on Post-War Problems of the Governing Board of the Pan American Union. 40 pp. Pan American Union, Washington, D. C.; 1943. A quotation from the Foreword explains the purpose of the document: "The present compilation has been undertaken as a contribution to the study of international organization that must be made in anticipation of the termination of the present conflict. It is not an attempt to set forth the accomplishments of the inter-American movement, but merely to present some of the basic principles on which this movement is founded; and especially those principles and procedures that govern the relations among the American Republics."

Enriqueta and I, by Argentina Diaz Lozano (translated from the Spanish by Harriet de Onis). 217 pp., illus. Farrar & Rinehart, New York; 1944. Winner of the first prize for nonfiction in the second Latin American Literary Prize Competition sponsored by Farrar & Rinehart and the Pan American Union. It is an autobiographical account of a childhood in rural Honduras, with its fiestas, its pleasures, its joys, its dangers, and its very color.

A Evolução do Cooperativismo no Brasil, by Fabio Luz, Jr. 10 pp. (processed). M. S. Serviço de Economia Rural, Brasil; 1943. A short résumé of the development of cooperatives, including Raiffeiseu and Luzzatti banks, from their beginning in Northern Brazil in 1902, closing with a classified statement of cooperatives in the Brazilian States in December 1941.

The United Fruit Company and Middle America, by A. A. Pollan. 27 pp. New School for Social Research, 66 West 12th Street, New York, N. Y.; 1944. This is a talk given by Mr. Pollan as one of the series of weekly Round Tables on Latin America conducted at the New School for Social Research in New York. Mr. Pollan presents the work of the United Fruit Company in the 10 sovereign American nations of the Caribbean area included in the term "Middle America" and in Colombia and Ecuador. He tells of the banana trade, the war-strategic crops which this area is producing, and of the School of Pan American Agriculture, *Escuela Agricola Panamericana,* located in the Zamorano Valley of Honduras and open provisionally in September 1943.

EDITOR'S NOTE.—The listing of publications here does not necessarily imply an endorsement of them by the Department. For copies of private publications, write direct to the publishing agency given in each case.

FOR BETTER LIVING IN BRAZIL

(Continued from page 150)

in child care and nursery supervision, and direction of playgrounds. This work is being carried on by the People's Central Institute and a number of private and governmental agencies under the direction of the Nutrition Division of the Brazilian-American Food Production Commission. Upon completion of this course these young women are expected to form the nucleus of a new Service somewhat comparable to the Home Demonstration Service in the United States. They are also expected to be instrumental in establishing the new Home Demonstration Service Training School at Fortaleza in northeast Brazil.

Although this school will be directly administered by the Nutrition Division of the Commission for the next year, it will function as an integral part of and in close cooperation with the Technical Section of SAPS so that at the termination of the present Brazil-American Food Agreement this organization may take over direct administration of the work without interruption.

The Home Demonstration Service Training School will offer a 1-year course which will include such subjects as principles of nutrition, food preparation, and meal planning; home management; child care and feeding; poultry; horticulture; and methods of home demonstration work. At first only 24 students will be accepted each year. They will preferably be single, between 20 and 35 years of age, and chosen on the condition that if they complete the course they will return to do home demonstration work.

Dr. Clara Furquim Sambaquy, former Commission nutritionist in Belém, has been selected to head up the new Home Demonstration Service school and to direct the eleven girls who are being trained for this Service. In preparation for her new work, Dr. Sambaquy has been working with home demonstration agents in Mississippi. Dr. Edison Cavalcanti, previously mentioned as director of SAPS, has also been in the United States recently, where he inspected the U. S. Home Demonstration Service and studied the methods used in its administration.

Success Seen for Program

There is a great need in Brazil, as in all countries of the world, for the sort of practical training the Brazilian-American Food Production Commission and the *Serviço de Alimentação da Previdência Social* are initiating. Action taken so far is substantial proof that Brazil is conscious of this need and is determined to do something about it. There will in all probability be many discouragements and frustrations in the development of the new Home Demonstration Service. But there are strong reasons to support the belief that the determination of these young women will see a successful Service in operation for better living in Brazil.

THE CANAL ZONE EXPERIMENT GARDENS

(Continued from page 147)

the practicability of its farm and nursery practices it operates some orchards, greenhouses, and a large vegetable farm on a commercial basis. Every week a few truck loads of the Experiment Gardens' produce are sold in its two stores at Balboa and Summit.

A wide variety of fruit is the Gardens' specialty. It includes the best types of grapefruit, oranges, limes, papayas, bananas, mangoes, avocados, and mangosteens. Since 50 acres of the gardens are equipped with sprinkler irrigation system, the dry season never interferes with production. These activities consistently turn in a profit which helps defray the expenses of maintaining the arboretum. A most creditable achievement of the Gardens and their landscape section in 1943 was the fact that revenue from their own services and products came within less than $18,000 of paying total operating expenses of more than $671,000.

Gardens Have Recreational Value

Perhaps of most importance to the average citizen of the Canal Zone's towns is the recreational value of the Gardens. With few places to go beyond the Zone because of gasoline and tire rationing and with few good highways, the Gardens are a favorite outing spot. Six outdoor fireplaces, complete with neatly stacked woodpiles, are ready for free reservation at all times. Picnic benches and tables are also provided. Every other Sunday during the dry season, the personnel of the Gardens conduct public tours of the arboretum. Since these tours afford an excellent opportunity for some United States residents on the Zone to become acquainted for the first time with plants they have always wondered about, they are well attended. Hundreds of Zonians first learned to know the amazing variety of tropical orchids, including the vanilla, at Summit.

Of special interest to scientists and to those whose business or hobby may be botany or plant culture, Summit provides a well catalogued reference library of past and current publications. Use of this library is made by local farmers, garden clubs, and plant fanciers. The station also has a small chemical laboratory for analytical work and a modest herbarium, part of which was collected by the plant explorer Paul C. Standley, author of "The Flora of the Panama Canal Zone."

As is well known, the Panama Canal engineers have transformed the isthmian swamps and jungles into one of the most healthful areas to be found in the Tropics. Perhaps someday, when the expanded nursery facilities of the Summit station can be devoted to peacetime needs, the Zone will also become one of the most attractive. Extensive plantings of the beautiful native and exotic ornamentals which are to be found in Summit's arboretum could make of its already trim and modern towns a veritable paradise.

ALONG THE *Agricultural Front*

▲ New Research Laboratory Planned for Cuba

The Cuban Ministry of Agriculture and other agricultural leaders of that country are proceeding with a plan for the creation of a research laboratory, to be operated independently of the Cuban Government and to carry on research in the fields of tobacco, coffee, fibers, vegetable oils, starches, and meat and dairy products, with special emphasis upon sugar and its byproducts.

The proposition is that the laboratory should be an autonomous organization administered by a Board of Directors composed of one representative from each of the agricultural commodity groups and that the existing commodity organizations would elect a representative. In addition, the Cuban Government would have one representative on the Board of Directors.

Funds for the construction of the laboratory building, totaling $250,000, would be obtained from a $25,000,000 loan from the United States to the Cuban *Comisión de Fomento.* Funds for operation would come from the various Cuban agricultural organizations, such as the sugar mill owners (*Hacendados*), the sugarcane growers (*Colonos*), the Tobacco Institute, Coffee Institute, Rice Growers Association, and the Cattle Association.

▲ Cuba Gives Appropriation For Extension and Research

Under a recent decree the Cuban Government announced the appropriation of $6,000 to the Ministry of Agriculture for the purpose of meeting the expenses which may be incurred in agricultural extension and experiments to be carried on by the Ministry in cooperation with the U. S. Department of Agriculture. This project is part of a program for the development of complementary agricultural products and sources of strategic materials.

Although fiber is not mentioned in the decree, it is believed that the funds appropriated are intended to be used for the cooperative fiber research project, since that is the only cooperative project between the United States Department of Agriculture and the Cuban Ministry of Agriculture.

▲ Workers Coming to U. S. From El Salvador

To assist in defense and agricultural work, El Salvador is planning to send 5,000 workers to the United States. El Salvador is largely a one-crop country and after the coffee season is over many workers can regularly be spared for service elsewhere several months a year.

AG IN AMERICAS GETS NEW EDITOR

With this issue of AGRICULTURE IN THE AMERICAS a new editor takes over. Stanley H. Gaines, who served successfully as editor of the magazine for some time past, has been promoted to a more responsible position in the USDA Office of Information, where he will devote most of his time to the preparation of special reports and other information on post-war planning for agriculture. For 5 years prior to his appointment as editor of the magazine Mr. Gaines did general information work with the Federal Crop Insurance Corporation.

The new editor is O. R. Carrington, who comes to the Office of Foreign Agricultural Relations from the University of Maryland, where, at various times, he has served as assistant editor and illustrator of the Extension Service, head of the Department of Publications, and adviser on student publications. Mr. Carrington is a graduate of the University of Maryland and has taken advanced work at American University. In addition, he has had considerable training and experience as an artist and free-lance illustrator.

LOUIS C. NOLAN
Chief, Division of Foreign Information and Statistics.

▲ Amazonian Farm Produces Food for Rubber Tappers

A small demonstration farm located far up the Amazon river is playing a vital war role in providing food for many hundred rubber workers in that area, according to reports received by the Institute of Inter-American Affairs.

The Institute is working with the Peruvian Government in the operation of the farm as part of a program to increase wartime production of food. More than 86 acres of land have been cleared and 54 acres planted to vegetables and fruits. Current plantings include 30 acres of rice, 7 acres of yucca, 400 coffee trees, 759 banana plants, besides tomatoes, carrots, okra, beets, eggplant, peppers, radishes, turnips, beans, and sweetpotatoes.

This food will greatly help in supplying the needs of some 5,000 rubber workers in the area. Reports from Iquitos state that the farm also is teaching Peruvian farmers the advantage of growing new types of crops.

Those in charge of the cooperative farm are assisting Peruvian military officials in the same area in the operation of a similar farm for the benefit of the Peruvian military forces located at Iquitos.

▲ Chile Plans to Establish Tung-Tree Orchards

Plans are being made to establish a number of tung-tree orchards in Chile. Private farms and experimental stations of the Ministry of Agriculture in central and south-central Chile are the areas that have been chosen for the orchards. Development of a tung-oil industry would materially help in Chile's program for a more diversified agriculture.

▲ Guatemala Announces Census of Coffee Workers

There were 425,544 persons employed in the production of coffee in Guatemala last year. Of this total, 282,603 workers belonged to the fixed farm population and 142,941 were seasonal labor. Forty percent of the workers were men, 28 percent were women, and 32 percent children.

SCIENCE'S FIGHT FOR HEALTHY HEVEA

(Continued from page 153)

method of thoroughly testing clones for resistance to leaf blight. The importance of this test lies in the consistent trend of gradually increasing blight severity in new areas planted with susceptible or slightly resistant hevea clones.

Until a hevea tree is about 1 year old, it has a maximum of one susceptible flush of leaves at any given time. After branching begins, the number of susceptible leaf flushes per tree increases rapidly, and on a 5- or 6-year-old tree may total hundreds. In proportion to the increase in susceptible foliage, there is increasing opportunity for blight to develop in epidemic proportions. In the absence of adequate resistance-testing measures, thousands of acres of susceptible and slightly resistant hevea trees were planted at field spacing in or near blight-infested areas. Many of these plantings grew well for 2, 3, or 4 years before they were destroyed by increasingly severe attacks of leaf blight. To prevent recurrence of these destructive attacks, blight-resistant clones were developed in testing plots which provided near-optimum conditions for blight development at the Cooperative Rubber Plant Field Station at Turrialba, Costa Rica.

Turrialba is located in a valley 2,000 feet above sea level and is subject to frequent mists and heavy night dews. On most nights during the year hevea foliage remains wet at least 10 hours. This is long enough for blight spores to germinate and infect the young foliage of susceptible plants. A constant and abundant supply of spores is provided by heavily diseased seedlings growing on alternate nursery beds with the clones and selections that are being tested for resistance to blight. This combination of conditions allows little opportunity for disease escape, and observations on a large number of clones have shown that the damage sustained by plants growing in the Turrialba plots for 6 or 8 months is comparable to the heaviest damage suffered by the same clones growing to maturity in dense plantation stands.

Several hundred clones showing high resistance to leaf blight have been selected after intensive resistance tests at Turrialba. These clones originated from the highest yielding seedling trees on the Ford Plantations, outstanding jungle trees, and special seed collections from widely separated parts of the Amazon Valley. The number of blight-resistant selections is being increased constantly by budwood collections from outstanding jungle trees and by an extensive breeding program.

The use of thoroughly tested blight-resistant clones in mixed field plantings and for top-budding high-yielding Oriental clones has now become standard procedure. In blight-infested areas, fungicidal sprays are used to control the disease on susceptible seedlings and Oriental clones until they are budded with resistant clones. As a result of the use of these modern-day pathological and horticultural procedures which have been used extensively for other crops, science has provided a way for growing healthy high-yielding hevea rubbertrees in tropical America.

TRAINING FARMERS FOR SAO PAULO

(Continued from page 154)

and liqueurs. Besides raising all their vegetables and grains, students supply milk for the school, breed livestock for meat, and raise work animals for the school farm.

The staff of this school is well trained, the director and the professors all being graduates of the State Agricultural College. In addition to their college work these men are required to take a practical postgraduate course, studying the work of the principal State experiment stations, the Agronomical Institute, the State Department of Animal Industry, and the State Agricultural College.

Experience has shown that about 50 percent of the graduates of this school return to farms in the State, while the others take positions in urban areas.

LATIN AMERICA PRODUCES MORE RICE

(Continued from page 145)

amount of labor for cultivating and harvesting.

Prior to the war, the United States, with its modern equipment for producing rice, had considerable difficulty in competing with Oriental rice growers in the European markets and in Caribbean countries. Even with the most advanced cultural practices, our cost of production apparently will not enable us to undersell rice produced by the Asiatic hand-laborers. And for Latin American countries that have not adopted modern equipment it also seems doubtful if rice produced by hand labor can compete with Oriental rice in foreign markets.

AGRICULTURE IN THE AMERICAS O. R. CARRINGTON, EDITOR

A monthly publication of the Office of Foreign Agricultural Relations of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 10 cents per copy, or by subscription at rate of 75 cents per year, domestic; $1.20 per year, foreign. Postage stamps will not be accepted in payment.

Gifts of the Americas

MAHOGANY

by WARREN D. BRUSH

Mahogany has truly been called "the premier cabinet wood of the world." It is one of the early contributions of the New World to the Old and represents one of the luxuries of civilized man. True mahogany (Swietenia Spp.) occurs naturally only in tropical America—in the West Indies, Mexico, Central America, and northern South America.

In its native habitat the wood is rarely considered of great value and is even used for rough construction and fuel; in the foreign markets it is easily the most valuable timber. History and romance are intimately associated with many of its important applications.

The earliest known use of mahogany in buildings was in the Cathedral of Santo Domingo, completed in 1550. This old church has much carved mahogany woodwork which is regarded as some of the finest in the world and is still in good condition after four centuries. Mahogany served also very early as a shipbuilding timber, and Cortez is said to have used it in building the ships for his voyages of conquest. The earliest known use of the wood in England was in Nottingham Castle, built in 1680.

The golden age in the use of mahogany covered the latter half of the eighteenth and the first quarter of the nineteenth centuries. This period witnessed the rise of the great Georgian master craftsmen—Chippendale, Hepplewhite, the Adam brothers, and Sheraton. In beauty of design and craftsmanship the furniture of the Georgian period has never been surpassed, and mahogany was the wood that was usually employed.

While its handsome appearance is the primary reason for mahogany's popularity, other reasons for its leadership as a first-class cabinet wood are minimum shrinkage, swelling, and warping; sufficient hardness to resist indentation; ease in working with tools (as in turning and carving); and the ability to take different finishes and a good polish. In addition, it veneers and glues well and makes excellent plywood. When the grain is wavy or curly, it often produces a highly attractive figure, although only a small proportion of the wood is capable of producing the intricate patterns which are so greatly prized.

Not only is mahogany a popular wood for furniture, including cabinet work in general, but it is used also for the highest type of interior woodwork in buildings and ships. It is an important wood for war uses—in the form of plywood it goes into boats and trainer planes; as lumber it is much in demand for patterns used in foundries.

Mahogany is the most important export timber of tropical America. Since the beginning of the eighteenth century, increasing quantities have been shipped. By the middle of the nineteenth century large amounts went to Europe for shipbuilding, principally from Jamaica and British Honduras. Nearly all the tropical American countries north of Bolivia, with the exception of the Guianas, now supply the world's requirements.

Mahogany trees grow to large size. They do not form pure stands, but are scattered through the forest with usually not more than one merchantable tree to the acre. The requirements for their optimum development are a rich moist soil and a tropical climate. The seedlings require overhead shade and freedom from overcrowding. Because of these exacting requirements mahogany plantations, which have been established in many parts of the world, have not always been successful. There seems to be no reason, however, why it cannot be grown on a commercial scale.

Although comparatively large quantities have been exported during the past 200 years, and much also has been used to supply local needs over an even longer period of time, there is still considerable timber available over wide areas. The more easily accessible regions have been nearly depleted, but in many rugged areas not favored with transportation facilities and in other remote regions there are unquestionably sufficient supplies for many years. By economical use, mahogany from tropical America will undoubtedly continue to serve as one of the world's principal cabinet woods.

THE DOMINICAN REPUBLIC

The Dominican Republic, somewhat larger than the States of Vermont and New Hampshire combined, occupies the eastern two-thirds of the Island of Hispaniola, the other third of which is occupied by Haiti. The country is divided into almost equal halves by the mountain range Cordillera Central, extending east and west. The Cordillera Septentrional parallels the north coast. Between these two ranges is the Cibao Valley, one of the richest agricultural areas in the country. Another fertile valley is the San Juan. The Atlantic Coastal Plain is a narrow strip of land, but the southern plain bordering the Caribbean is wide and fertile. Four major river systems drain the watersheds of the Cordilleras.

Climate

The mountains and the trade winds temper the climate of the Dominican Republic. The higher elevations of the interior are cool, and the climate of the coast lands is moderated by the ocean breezes, the average annual temperature on the coasts being 78° F. The rainy season lasts from May to November, with heaviest rainfall in the eastern part. In the prosperous Cibao Valley rainfall varies from 47 inches at Moca to 92 inches at San Francisco de Macorís.

People

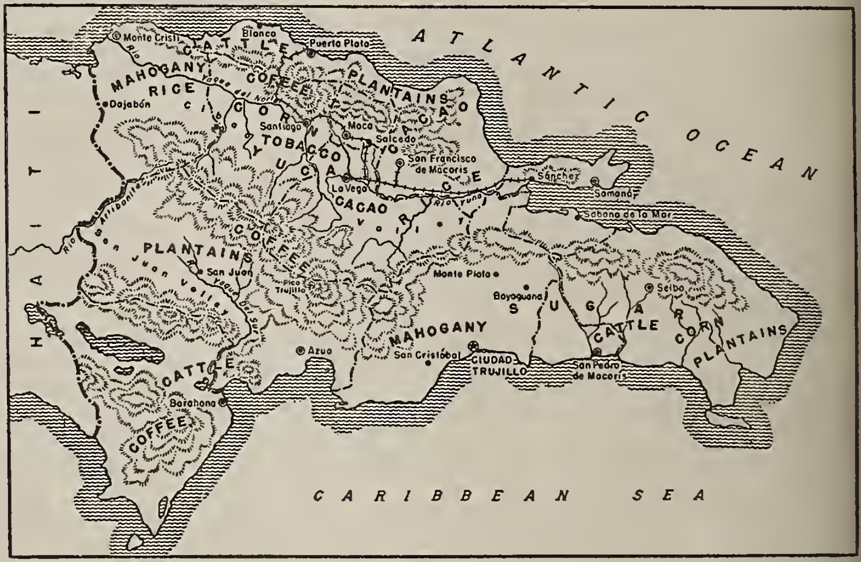
More than four-fifths of the total population, which in 1941 was estimated at nearly 1.8 million, live in rural communities. Ciudad Trujillo, the capital and largest city—originally called Santo Domingo—has approximately 75,000 people; Santiago de los Caballeros is the second largest city. While the population density does not approach the crowded conditions of Puerto Rico or Haiti, the concentration is heavy in the fertile valleys and coast lands. The original Indian population has been assimilated, the present composition being roughly 13 percent white, 19 percent black, and the balance mixed races.

Forest Resources

The forest resources of cedar, satinwood, mahogany, lignum vitae, juniper, dyewoods, and pine are extensive, although much of the pine and hardwood has been cut. Exports of timber in 1939 totaled $100,000.

Agriculture

In common with other islands of the West Indies, the Dominican Republic's principal money crop is sugar. Coffee and cacao are next in importance. The country is practically self-sufficient in food with the exception of wheat flour, dried and salted fish, and some fats and oils. Rice production has increased in such proportion that the Republic has shifted from an importer to an exporter of this product. Other exported commodities are dairy products, poultry, and beans, most of them to nearby deficit areas.



Sugar exports formerly went to Europe. With the closing of these markets, stocks have been piling up in warehouses since 1941, and production in 1943-44 was limited, to keep the supply within bounds. Most of the sugar is grown in the southeast part of the country, particularly in the provinces of San Pedro de Macorís and Seibo. Both coffee and cacao are grown in the Cibao Valley and on the slopes of the mountains. Compared with sugar, cacao is in a fortunate situation, for shipments are moving out regularly.

Yuca, plantains, corn, and a native type of sweetpotato are the main items of diet, and they are all grown in sufficient quantity to supply domestic consumption. These four vegetables combined with a little meat make up the national dish, *sancocho*.

The Government's policy in recent years has favored agricultural diversification, and the wartime demand for rice, beans, and other foods has hastened this development. While sugar and cacao are still supreme in the economy of the country, production of various foods for home use and export to neighboring islands is expanding rapidly.

Almost a million acres of land are in planted pastures to sustain the livestock population, which, according to the 1940 census, includes 804,000 cattle, 782,000 hogs, 37,000 sheep, and 243,000 horses. A modern packing plant just completed is to provide the basis for an expanded meat industry for both home use and export.

☆ U. S. Government Printing Office 1944—597474

52-A
6

Agriculture in the Americas

Issued Monthly by the OFFICE OF FOREIGN AGRICULTURAL RELATIONS
UNITED STATES DEPARTMENT OF AGRICULTURE

IN THIS ISSUE

PAGE

New Ties Across the Border 162

The River Basins of Latin America 163

Mexico and the United States Discuss Mutual Farm Problems 168

Escuela Agrícola Panamericana 172

Along the Agricultural Front 177

LIBRARY
CURRENT SERIAL RECORD
SEP 27 1944
U. S. DEPARTMENT OF AGRICULTURE

September 1944

NEW TIES ACROSS THE BORDER

At the opening session of the Mexican-United States Agricultural Commission in Mexico City on July 4, 1944, addresses were delivered by Marte R. Gómez and Claude R. Wickard, Secretaries of Agriculture for Mexico and the United States respectively. Both men praised the friendly relationship and cooperative work that is being carried on by the two countries.

Minister Gómez, in his address of welcome, said: "The most solid and durable friendships are those made when men struggle and endeavour to bring to a happy conclusion a program which they are convinced is just and generous. Among such programs was that projected at the Second Inter-American Conference of Agriculture held in this City in July 1942, and in honor of this conference, I am very pleased to express the special esteem I have for Mr. Claude R. Wickard, and to let him know how pleased we all are to see him again in our midst.

"Furthermore, his presence is of particular significance for the installation and first meeting of the Mexican-United States Agricultural Commission, with whose attendance we count upon to plan and solve, in a high spirit of mutual technical cooperation, of clear understanding and of good neighborliness, rural problems which are common to us, and the solution of which is of equal interest to the people of both our countries."

In speaking of the opportunity that is presented to the Commission for aiding both countries Mr. Gómez pointed out: "The Governments of the United States of America and of Mexico hope that this Commission will be of highest value in promoting the development of agriculture in both nations, in accordance with principles which may permit them to solve their own problems and contribute to the solution of the neighbor's problems, taking into consideration the climatic and sociological peculiarities and the technical and economic resources of each.

"We hope that, by means of a joint and uniform action the eradication, or at least, the control of plagues and diseases attacking our cattle and fields will be attained easily.

"Furthermore, we believe that a more active interchange of products and the application of the latest developments in the preparation and conservation of foodstuffs, may give us the opportunity to improve and add variety to the diet of our peoples.

"We are not unaware of the importance of taking advantage of our tropical situation for the production of industrial and medicinal plants which we had abandoned to distant countries."

Mr. Gómez closed his address by contrasting the methods employed by the totalitarian and democratic countries for settling mutual problems. He declared: ". . . an assembly such as this one, which prepares a peaceful solution of the problems created by the . . . contact of two neighboring peoples . . . constitutes much more than a good omen, more than a promise, more indeed than a hope.

"It is a conquest in which the United States of America and Mexico believe and accept as their own, but it is not exclusively theirs because it opens roads and clears horizons which are and must be the patrimony of all mankind."

Secretary Wickard, in replying to Mr. Gómez's address, declared that the Commission can play an important part in contributing to the prosperity and security of Mexican and United States farm people.

"One reason for this prospect is the ability and character of the membership of the new Commission. Both nations have named men who are outstanding for their work in the fields of agricultural science, economics, or sociology. Another reason lies in the fact that the Commission will be building on a solid foundation of past accomplishment. It is not setting out on an uncharted course in the mere hope of a fortunate landfall. Instead, it will be working to greatly broaden the two-way movement on an already well-tried route."

Secretary Wickard pointed out that one of the first tasks of the new Commission will be to appraise the large volume of research and regulatory work already being jointly carried on by the two countries. In this connection he praised the fine relationship that has existed between veterinarians, and other scientists and technical experts of Mexico and the United States. "The recent cooperative work in combating scabies of cattle in Chihuahua, and the present effort by veterinarians of both countries to eradicate dourine of horses in the border region of Sonora are two outstanding examples of collaboration. The United States veterinarians who work on such projects not only have the privilege of helping check a threat to the livestock of their own country; they also have the opportunity of obtaining valuable information from their Mexican associates.

"The same friendly cooperation between the two nations has marked the fight against the Mexican fruitfly. Soon after the fly was found in southern Texas, the U. S. Department of Agriculture asked permission to set up a laboratory in Mexico and the Mexican Government promptly granted the request. Cooperative relationships have been most friendly ever since. The quarters which the laboratory now occupies here in Mexico City were built especially for that purpose by the Mexican Government. That friendly action has helped us greatly in our fight against the fruitfly and is deeply

(Continued on page 178)

Agriculture IN THE *Americas*

Vol. IV. • SEPTEMBER 1944 • *No. 9*

The River Basins of Latin America

The agricultural and industrial development of any country is closely associated with its river systems. In this article various factors affecting the agricultural production of selected river basins and the general type of surface drainage in Latin America are discussed briefly.

by R. G. HAINSWORTH

A greater variety of river basins is found in Latin America than in any other region in the world. The rivers range in size from small mountain streams, some of which are utilized to irrigate narrow mountain valleys, to the immense Amazon River system which drains the largest area in the world. The Río Loa in northern Chile flows through one of the world's driest regions, whereas the Amazon flows through one of the wettest. Extreme variations exist also in the races of people, land forms, resources, and climate found in these basins.

The 8 million square miles in Latin America constitute 19 percent of the total area of the world's inhabited continents. The population of about 130,000,000 people is approximately 6 percent of the world's population. Most of the people of Latin America live in concentrated areas along the rivers and seacoasts.

Since the rivers have been the principal means of transportation for these concentrated population centers they have influenced greatly the production of agriculture and its relation to industry.

The drainage from most of the river basins of Latin America reaches the sea, but there are a few areas generally contributing no surface drainage or from which the drainage does not reach the sea. These few areas are mostly in the northern part of Mexico, on the Peruvian coast, in Bolivia, Paraguay, northern Chile, Argentina outside the Pampas, and in the bulge of Brazil.

MEXICO

Mexico has few large rivers with a normal annual flow. This is due to the topography of the country, particularly the great plateau, which with its bordering mountains makes streams of any considerable length impossible. Occasional rapid torrents descend to the sea from the plateau, but the unequal distribution of rainfall throughout the year and the absence of forests in the central and northern areas make them flood streams at certain seasons and dry gullies at others. Many of the streams are of little aid to agriculture because they do not have sufficient water for irrigation during the periods when water is required by crops. This situation is being alleviated somewhat by the installation of dams.

The Río Grande is Mexico's largest river. At one time it was entirely within Mexico's borders. Later, it became the boundary between the United States and Mexico for many miles. With its tributary the Río Conchos, it forms one of the most important waterways.

In the northern end of the Lower California peninsula, where the Colorado River flows into the Gulf of California, a small area around Mexicali is irrigated from the Colorado, enabling it to produce various commercial crops. It is an extension of the Imperial Valley of California in the United States. Emptying into the Pacific farther south are two important waterways—the Río Lerma-Santiago and the Río Balsas-Mexcala. About 15 miles from the city of Guadalajara the Lerma is precipitated over the magnificent falls of Juanacatlán, called the Niagara of Mexico. In the southeastern part of Mexico, east of the Isthmus of Tehuantepec, the Grijalva-Usumacinta River basin empties into the Gulf of Mexico. Commercial crops such as henequen, coffee,

The author is a member of the staff of the Office of Foreign Agricultural Relations. He is well known for his contributions to various government publications on geography and world statistics. At present he is making a study of major agricultural commodities on a world basis.

Courtesy of the Pan American Union

Courtesy of American Geographical Society †

A study in contrasts. At the left is a picture of the upper reaches of the Marañón River, high in the Andes Mountains, from which the mighty Amazon gets its modest start. On the right the Amazon, in all its majesty, pushes out to sea. In spite of the fact that the tides from the Atlantic are effective 500 miles inland, the force of the Amazon is so great that fresh water is carried 100 miles out to sea

bananas, chickpeas, and sugarcane are grown in these various river basins, with maize, the Mexican staff of life, occupying more acreage than all other crops together.

In the great plateau some of the valleys have chains of lakes, which seem slowly to be drying up. At one time Mexico City was a city of islands surrounded by the waters of Lake Texcoco. Today the only lake of importance is Chapala, which furnishes a favorite resort region for wealthy Mexicans.

CENTRAL AMERICA

In Central America, lying completely within the tropics and on the path of prevailing trade winds, the climate necessarily would be damp and hot but for the prominent mountain system, which influences both temperature and rainfall. Since the main watershed runs near the Pacific coast, the rivers entering the Atlantic are longer, and some of them are navigable for light-draught boats.

There are numerous lakes in Central America. Chief among them is the great lake Nicaragua, into which Lake Managua discharges. West of Guatemala City is the depression, rimmed by great volcanoes, which holds the magnificent Lake Atitlán, a fresh water lake having no surface outlet. In northern Guatemala also, in the limestone region, lakes without outlets are common. The drainage is underground, except that after heavy rains the water in some of the lakes overflows and spreads over the surrounding surface. Along both coasts are numerous lagoons of brackish water.

The northernmost lowland, located on the border between Guatemala and British Honduras, is drained by the Río Sarstún, and the southern valley of Guatemala is drained by the Río Motagua, a river rising among the volcanoes of the southern highlands. Between these two rivers the middle lowland is occupied by the shallow and swampy Lago de Izabal, and the three deep valleys in the central highlands are low, rainy, and hot.

El Salvador has several rivers highly important from the standpoint of soil building and agriculture, though none of them are navigable by large craft. Of these, the Paz, the San Miguel, and the Lempa, which crosses the country from north to south and makes one of the most fertile valleys in the American tropics, are of most importance.

There are also a number of lakes within the Republic including the Guija in the northern part and Ilopango near the Capital. Ilopango is called the "Lake of the Miracle." Early in 1880 the waters of the lake suddenly rose several feet above normal levels, causing a violent overflow of the little streams that feed from the lake into the river Jiboa, which in turn became a raging torrent with a channel 30 feet deeper than usual and flooded adjacent lowlands. Within 2 months the surface of the lake had fallen about 35 feet, and toward the center of the lake an island, at least 500 feet in diameter, had risen from the water. The island proceeded to rise higher and higher, until now it towers to a height of more than 150 feet above the lake.

In Honduras most of the cultivated land is centered along the great flood basins of the Caribbean or "North" coast, extending inland 60 to 75 miles. The foremost landmark for bananas is the slow-moving, meandering Ulúa River, which begins high up in the shelf-lands, passes through the banana capital called Progreso, and empties into the Bay of Honduras.

A range of mountains extending more or less in a north-south direction divides Nicaragua, the largest of the Central American Republics, into two very different sections. The vast east coast region is characterized by high humidity, and a wide expanse of low, relatively flat land that was formerly a flourishing banana area. On the Pacific side of the range, coffee, corn, sugarcane, sesame, cotton, dairy cattle, and other agricultural products combine to make this an area of great agricultural importance.

---

† Photograph by John L. Rich from "The Face of South America" published by the American Geographical Society of New York.

There are numerous rivers in Costa Rica, most of them clear and swift, dashing from high mesas down into luxuriant flood plains, their courses resplendent with high falls and cataracts, beautiful forests, and luxuriant mountains. The highlands have been cut deep by streams that have made narrow canyons, leaving only small areas with relatively gentle slopes. The largest depression in the highland is drained by the Río Diquís, which turns at right angles through a narrow gorge and drops about 600 feet on its way to the sea.

The southeastern part of the Meseta Central, a large plateau located 3,000 to 4,000 feet above sea level between the main cordillera and the slope of volcanoes, is drained by the Río Reventazón, flowing eastward to the Caribbean coast, while the northwestern part of this plain is drained by the Río Grande, flowing westward to the Pacific. Much of the northeastern part of Costa Rica is swampy, especially near the coast.

The principal agricultural products of Costa Rica are coffee, bananas, and cocoa. The crops commonly cultivated are maize, sugarcane, rice, and potatoes. There are a few thousand acres under tobacco.

Rivers of Panama are few and relatively unimportant. Only three-eighths of the land of Panama is occupied and but little of that is cultivated. Bananas are an important crop and are exported mostly to the United States.

The principal river in the Crown colony of British Honduras is the Belize and the chief forest products are mahogany, chicle, cedar, rosewood, and logwood.

SOUTH AMERICA

Rivers are extremely important to life in South America, both because they influence production and because transportation has depended largely upon them. Now with greater highway, railroad, and air transport facilities they should play an even greater part in the development of the resources of the country.

Colombia, the country extending farthest north in South America, has a population of about 9,500,000 people, most of whom live within the Magdalena-Cauca River basin. The great Magdalena, flowing northward between the central and western ranges, is one of the busiest waterways of the hemisphere and is referred to as the Mississippi of Colombia. The Cauca, also flowing northward, drains the valley between the central and western mountain ranges and flows into the Magdalena.

In the fertile and versatile Magdalena basin the agricultural resources are distinctly tropical crops, such as bananas, cacao, rubber, and coffee. Barranquilla is the trade center of the Magdalena basin, with a population of 180,000

Courtesy of the Pan American Union

Higher than Niagara, the Iguassú Falls of Brazil are one of the great potential sources of power in Latin America. Located on the Paraná River, just north of the intersection of Brazil, Paraguay, and Argentina, the falls are only 800 miles from the great metropolis of Buenos Aires

and Santa Marta, with a population of 45,000, was until 1942 an important banana center.

Down the steep sides of the westerly mountains into the Pacific dash rapid plunging streams—the San Juan, Dagua, Patía, and others. Colombia's rivers are small, however, with the exception of the Magdalena and Cauca.

Venezuela has a population of over 3,500,000 and covers a total area of 352,143 square miles. Its largest river basin is the Orinoco, which with the tributaries—Apure, Arauca, and Meta—drains approximately 365,000 square miles, a vast plain sloping gently from the Andes and known as the Orinoco Llanos. The headwaters of the Orinoco proper are in the Amazonzas territory and they flow in a northerly direction to the coast. From June until October the greater part of the Llanos is under water and the dry season runs from January through March, making any large cropping system largely impossible and even cattle raising trying. Venezuela's population is centered largely in the highlands north of the Orinoco Valley. Around the headwaters of the Tuy River in the basin of Lake Valencia, agriculture is more highly developed.

Although the rivers in Ecuador are not large, flowing down from the Cordillera westward a few hundred miles to the Pacific, or eastward to join the mighty Amazon, the greater part of the people live in these basins between the East and West ranges of the Andes. The Tulcán River basin is on a plateau too high for any crops except potatoes. South of this lies the Ibarra basin, also on a plateau, on which grain and potatoes are grown; and down in the lowlands are plantations of sugarcane and cotton. In the Quito basin, where Quito, the capital city, is located, various cereal crops and pasture lands are found. In the basins of Riobamba and Alusi, south of Quito, cereal crops and vegetables grow well on the alluvial soil of the valley. Guayas Valley is the most productive part of Ecuador in terms of export commodities, producing rice, cacao, coffee, balsa, tagua nuts, rubber, cinchona bark, toquilla (Panama hat) straw, and kapok.

Most of Peru's population of over 6,200,000 live in the irrigated valleys and uplands. The coast is so dry, cold, and lacking in rainfall that the country's agriculture depends mainly on irrigation from over 50 small rivers which are fed by the snow and rainfall on the Andes Mountains. They flow at almost right angles to the Pacific through the dry coast area and are too small to be navigable by steamers. On the other side of the Andes are the headwaters of the Marañón, which is the beginning of the Amazon.

The most important rivers in Chile are the Bío-Bío, the Aconcagua, and the Mapocho, all in the central part of the country. The Copiapó River has a narrow strip of cultivated land which marks the southern border of the desert of northern Chile. Southern Chile covers about one-third of the country and has many rivers, but only about 1 percent of the people live there. It is an area of heavy rains, high winds, steep rocky slopes, and storm-tossed waters.

In the northern part of Argentina there are three large river basins: the Paraguay River, flowing down from Paraguay, unites with the Paraná, and just before they reach the Atlantic they join the Uruguay and form the great estuary of La Plata. These rivers drain parts of Argentina, Uruguay, Brazil, Paraguay, and Bolivia. Some of the richest agricultural land and the greatest cattle raising section of the continent are located in these river basins. The climate is mild, rainfall adequate, and the soil productive. The great undeveloped Chaco region lies northwest of the Paraná.

Farther south the San Juan River, flowing down from the Andes, joins the Mendoza, Diamante, Atuel, and Colorado and empties into the Atlantic south of Bahía Blanca. In this basin are found grasslands and desert shrub, with some spots of irrigated land producing fruits and vegetables.

Still farther south, in the Patagonia area of cool, dry, wind-swept plateaus, the Río Negro, the Chubut, Santa Cruz, and Gallegos flow into the Atlantic. Here sheep grazing is the chief industry.

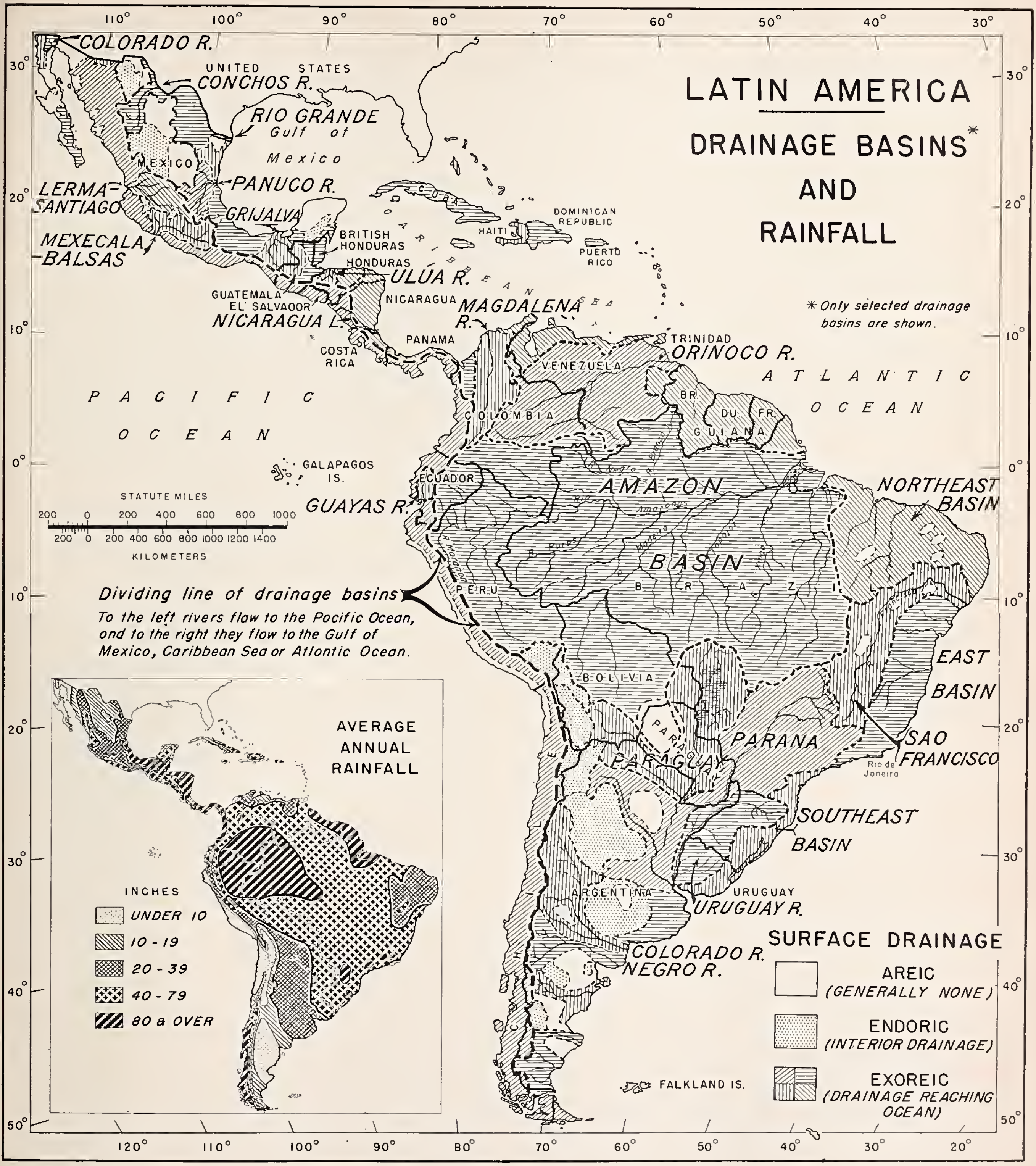
Brazil has two large drainage systems. The Amazon system is well known for its vastness as well as for the large extent of its navigable waterways. The area drained by this great river is 2,700,000 square miles. The vastness of the system is better understood when we remember that the continental area of the United States is about 2,977,128 square miles. Although the Amazon is not the longest river in the world, the volume of water it conveys to the sea is the greatest carried by any river, a fact easily explained by the heavy tropical rains which fall over most of the drainage area.

This mighty river has its modest beginning about 80 miles from the Pacific Ocean in the Cordillera Huayhuash in Peru. Various streams from a small group of lakes some 18,500 feet above sea level unite and flow rapidly for about 15 miles into the Lauricocha Lagoon at an elevation of approximately 13,000 feet, and this flows into the beginning of the Marañón River, the most western tributary of the Amazon. Joined by various other tributaries, the river flows through gorges and rapids in its descent from the Andes. Then the fall is gentle, and indeed so small is the gradient that in the last 2,000 miles of its flow the river descends only about 35 feet, an average of about 0.2 inch per mile. It frequently overflows. During these periods of flood, some of the tributaries spread out to a width of over 150 miles.

In its lower course the main stream varies in depth from 60 to 300 feet and at its junction with the Río Negro, nearly 1,000 miles from the sea, it is between 120 and 130 feet deep. Ocean-going steamships can ascend the river to Iquitos in Peru, a distance of 2,300 miles.

The Amazon basin is the rubber-producing country,

(Continued on page 176)



This map shows the major drainage basins and rainfall of Latin America. The heavy, broken ridge-line of the Andes and other mountains to the North form the dividing line from which the rivers flow either east or west. The major river basins are outlined with a lighter, broken line. Areas that drain to the sea are indicated by hatched lines; areas of interior drainage are shown by stippling, and those areas with no drainage have been left white. The average annual rainfall, shown in the inset, is closely related to surface drainage conditions in the various areas

Mexico and the United States Discuss Mutual Farm Problems

Many important steps were taken for the development of agriculture and improvement of rural living at the first meeting of the Mexican-United States Agricultural Commission, held in Mexico City from July 4-11.

by JOHN J. HAGGERTY

The first meeting of the newly organized Mexican-United States Agricultural Commission, held in Mexico City from July 4 to 11, marked a new and important step in international collaboration in the field of agriculture. Established earlier in 1944 in accordance with an agreement between the United States and Mexico effected by an exchange of notes, the Commission seeks to promote the development of agriculture in the two countries along mutually advantageous long-time lines, while at the same time taking into consideration the special demands of the wartime situation. During the week the members of the Commission reviewed the status of various cooperative agricultural activities previously initiated by the two countries, surveyed the outstanding agricultural problems with which both countries are confronted, but about which no common action had been taken, and selected for immediate attention those which seemed most pressing as a result of present-day conditions.

Most Urgent Problems Considered

Perhaps the most urgent problems to which attention was devoted at the conference were those connected with the post-war outlook for certain agricultural products, particularly those whose production has been stimulated by the war, and the development of plans for the return and reabsorption into Mexican economy of Mexican workers now employed under contract in agriculture and other essential war work in the United States. Other subjects considered included measures to encourage the systematic and timely exchange of information resulting from scientific research; the desirability of greater emphasis on the training of professional agricultural personnel through the exchange of technicians and graduate students; more intensified cooperation in stamping out serious outbreaks of plant and animal diseases; joint action for the development and protection of such natural resources of an international character as migratory birds and wild game; assurance of the validity, quality, and sanitary certification of imported and exported seeds and livestock; and cooperative investigation of ways and means to improve the general welfare of farm people.

Formation of the Commission brought to fruition a long cherished hope of agricultural leaders in both countries. Plans for its actual establishment had been discussed by Señor Ing. Marte R. Gómez, Mexico's Secretary of Agriculture, and Mr. Claude R. Wickard, United States Secretary of Agriculture, while in attendance at the Second Inter-American Conference of Agriculture, held in Mexico City, July 6 to 16, 1942. The matter was discussed further at the time of the World Conference on Food and Agriculture at Hot Springs, Va., in May 1943. Since that time the United States Ambassador George S. Messersmith at Mexico City has worked energetically for the Commission's establishment.

Meeting Starts Broad Attack

In his address officially opening the meeting Señor Marte Gómez, Mexican Minister of Agriculture, pointed out that the gathering was the beginning of a broad attack upon fundamental agricultural problems of common concern to Mexico and the United States. In referring to the new Commission he said, ". . . we count upon [the Commission] to plan and solve, in a high spirit of technical cooperation, of clear understanding and of good neighborliness, rural problems which are common to us and the solution of which is of equal importance to the people of both our countries . . . Modest and peaceful men of science are gathered together . . . let us await with optimism and calm the fruit of their deliberations, for their harvest shall be our harvest."

In his reply, Mr. Claude R. Wickard, United States Secretary of Agriculture, said: "Establishment of the Agricultural Commission is another evidence of the friendship

---

The author has been connected with the U. S. Department of Agriculture since 1934, except for one year. At present he is Principal Agricultural Economist in the Western Hemisphere Division of the Office of Foreign Agricultural Relations.

Claude Wickard, U. S. Secretary of Agriculture, addresses the opening session of the Mexican-United States conference in reply to the address of welcome by Marte Gómez, Mexico's Minister of Agriculture, who is seated at Mr. Wickard's immediate left. To the left of Minister Gómez are Lic. Manuel Tello, Mexico's Acting Minister of Foreign Affairs; and Leslie A. Wheeler, Director of the Office of Foreign Agricultural Relations, U. S. Department of Agriculture. At Secretary Wickard's right are Mr. George Messersmith, United States Ambassador to Mexico, and Ing. Alfonso González Gallardo, Mexico's Under Secretary of Agriculture

between our two great nations. It writes a new chapter in the history of agricultural cooperation between the two countries. In the past both countries have gained from their willingness to work together in many fields of agricultural research. . . . At these meetings here this week we are taking a long step toward consolidating the many lines of cooperation already developed, and are broadening the foundations for greater agricultural cooperation in the future. The work of this Commission may well be the starting point of far reaching contributions to the well-being of the people of Mexico and the United States."

Membership and Scope of Work

Mexico is represented on the Commission by Señor Ing. Alfonso González Gallardo, Under Secretary of Agriculture; Señor Ing. Darío L. Arrieta M., Director General of Agriculture; Dr. Guillermo Quesada Bravo, Director General de Ganadería (Livestock Service); and Señor Ing. Gonzalo Gonzales H., Director General of Rural Economy. The following officers were designated to serve on the United States Section of the Commission: Mr. Leslie A. Wheeler, Director of the Office of Foreign Agricultural Relations, Department of Agriculture; Dr. Eugene C. Auchter, Administrator of the Agricultural Research Administration, Department of Agriculture; Dr. Lester D. Mallory, Agricultural Attaché of the American Embassy at Mexico City, and Mr. Carl N. Gibboney, Chief of the Food Production and Procurement Division, Foreign Economic Administration. During the conference Señor Ignacio de la Torre y Formentó, of the Mexican Ministry of Agriculture, and Mr. John J. Haggerty, of the United States Department of Agriculture, served as secretaries for their respective sections.

Early in the conference the decision was made that the Commission, both in its current and future activities, would function solely in a technical, coordinating, and advisory capacity. As a technical body it will concern itself with all the agricultural sciences, including the social sciences, wherever they can contribute toward the development of agriculture and improvement in the welfare of rural people of both countries. As a coordinating group it will review all cooperative work now under way, make recommendations for the consolidation of such activities, and suggest new avenues of cooperation, including that of state and private institutions as well as those of the Federal governments. As an advisory body, the Commission recognizes that it has no executive power, particularly in establishing public policy. The expectation is, however, that any recommendations made by its two sections will receive serious consideration on the part of the respective governments.

Existing Cooperative Activities Surveyed

Considerable time was devoted at the meeting to a general survey of a wide range of cooperative projects already being carried on between the United States and Mexico. A general review of these was presented by Dr. E. C. Auchter, Administrator of Agricultural Research, U. S. Department of Agriculture. Dr. J. G. Harrar, Director of the Rockefeller Foundation in Mexico, outlined the program of that agency, and Dr. A. C. Baker, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, described important developments in insect control.

The work now being done in the investigation and control of insects and plant diseases was pointed to as perhaps one of the outstanding demonstrations of current technical collaboration in the agricultural field between Mexico and the United States. Notable accomplishments were mentioned in the control of cotton pink bollworm, the Mexican fruitfly, and the introduction of a parasitic wasp which promises to bring about control of the citrus black fly. A number of significant developments were reported also in the fumigation and sanitation of fruit crops. These eventually may permit the relaxation of certain quarantine regulations, it was said.

The rubber program was cited as still another important example of existing cooperation between the two countries. More than 1,500,000 seedling trees are now growing in nurseries under that program, and the plans provide for the completion in Mexico of approximately 1,000,000 grafts of high yielding strains by the close of the year. As a part of a cooperative sugar investigation program, Mexico has received from the United States samples from the world's greatest collection of sugarcane varieties. Mexico's collection, near Vera Cruz, in turn will provide a plant bank available to both countries.

Investigation of the stem rust of wheat, Mexico's most serious small grain problem, was cited as one of the principal projects being worked on by the Rockefeller Foundation. Dr. Harrar, Director of the Foundation, pointed out that in the United States Wheat Belt the so-called summer spores of the rust are normally killed by low winter temperatures but that in Mexico they remain viable for considerable periods of time. Moreover, he stated, distinct races of stem rust have been found in the two principal wheat producing areas of Mexico. He emphasized also that the problem of wheat improvement is not limited to the development of rust resistance. The so-called Mexican wheats are a heterogeneous lot, probably from many parts of the world. In addition to rust resistance, he continued, it is necessary to select and breed for adaptability, yield, quality, and uniformity.

The fever-carrying tick and scabies were referred to as

Courtesy of the Pan American Union

The modern and beautiful metropolis of Mexico City where the first meeting of the Mexican-United States Agricultural Commission was held in July 1944. The modernistic structure on the right is the Insurance Building; a corner of the Palace of Fine Arts is seen at the extreme left

the two most important current problems in the inspection and quarantine of livestock. Mexico's current four-year campaign against those diseases is expected to result in a substantial degree of control. Further illustrative of the collaboration between the two countries on agricultural problems of mutual concern are the steps being taken to protect against the spread of hoof-and-mouth disease. Because of the imminent danger of an outbreak of foot-and-mouth disease due to difficulties in inspecting cattle and cattle products moving from infected sources in foreign countries, Mexico and the United States are actively planning the organization of "mixed brigades" to stamp out such an outbreak in either country if it should occur.

During the last half of the conference attention was devoted to agricultural problems of special interest to both countries but which are not at the present time being covered by cooperative projects. Included among these were the need for experimental work in agricultural crops and animal husbandry; economic studies of the post-war market situation for selected farm products; the exchange of scientific and technical information; the training of professional personnel in agriculture; investigation of how to assure the validity, quality and sanitary certification of seed and livestock that enter into international trade; protection, improvement and management of natural resources; and methods for improving the welfare of people in rural areas.

Eight Projects Adopted by Meeting

Eight definite work projects were established by the Commission at its closing session. These were:

1. Comprehensive studies on all aspects of production, trade, consumption, and prices, with emphasis on the post-war outlook, with respect to vegetables, cattle, henequen and ixtle fibers, and *garbanzos* (chickpeas). These are to be technical studies and are designed to form a basis for future policy recommendations. They will be prepared in tentative form by experts in the United States and then submitted to the appropriate Mexican authorities for incorporation of their information and ideas. Other special memoranda are to be similarly prepared and transmitted covering the prospective United States market for garlic, onions, coffee, bananas, pineapples, and vanilla.

2. Exploratory studies on the problem of assuring the validity, quality, and sanitary certification of seeds and livestock that enter international trade. This is a complex problem since each country has its own internal standards and requirements. Believing that uniformity in domestic and foreign inspection and regulatory procedures is essential, the Commission assigned a standing committee to that problem. The members will correspond with each other and most likely will meet at least once in a mutually satisfactory place for preliminary exploration and discussion. The expectation is that it will be prepared to offer a specific program on selected specific commodities at the next meeting of the Commission.

Members and secretaries of the Mexican-United States Agricultural Commission convene in the Salon of the Ministry of Agriculture. From left to right are Dr. E C. Auchter, Ing. González Gallardo, Leslie A. Wheeler, Ing. Darío L. Arrieta, John J. Haggerty, Ing. Gonzalo González H., Carl N. Gibboney, Dr. Lester D. Mallory, Ignacio de la Torre y Formentó, and Dr. Guillermo Quesada Bravo

3. Measures which will permit prompt cooperative action in the stamping out of any serious outbreak in either country of plant or animal disease. Among the measures under consideration to facilitate this work are special arrangements with the respective foreign offices, immigration and customs authorities, and other authorities as necessary, to permit the prompt movement across the border of the technicians, together with their vehicles and equipment, whenever a situation develops which, by mutual agreement, renders such a course necessary.

4. Development of preliminary plans for the systematic and orderly return to Mexico and reabsorption into Mexican economy of the Mexican labor force now employed under contract in the United States. For the most part, these men are engaged in agricultural work. Recent estimates placed the total number at approximately 75,000. It is of course not yet possible to predict, with any degree of accuracy, the date when the war will end, and the time when such labor no longer will be needed for war work in the United States.

5. Study of measures to improve the welfare of farm people. The meeting devoted special attention to such questions as nutrition, health, sanitation, and education. The discussion emphasized the diversity of cultural patterns, customs, and psychology. In consequence, the necessity of developing specific educational and extension methods adopted to these various cultural patterns was recognized. A special standing committee was designated to make preliminary exploratory investigations with a view to proposing a more specific approach at the next meeting of the Commission.

6. Protection, improvement, and management of natural resources, such as wild game, boundary lands, and waters. A standing committee, therefore, was designated to explore

(Continued on page 176)

Escuela Agrícola Panamericana

This is the story of the progress of the agricultural school in Honduras which was established by the United Fruit Company to train Latin American boys to be better farmers.

by WILSON POPENOE

The undeveloped natural resources of the majority of tropical American republics lie mainly in the field of agriculture. The training of agriculturists, not only for the scientific cultivation of standard crops such as coffee and sugarcane, but more especially for intensive or horticultural work with new crops, with fruits, and with vegetables, long has been recognized as one of the chief needs throughout this part of the world. It is a need which calls for the cooperative effort of all interested persons and which cannot be satisfied fully by sending young men to other parts of the world for agricultural training. At this stage, sound vocational training acquired locally is held by many thoughtful people to be of greatest value.

With a view to assisting along this line, the United Fruit Company has established an agricultural school in Central America, *Escuela Agrícola Panamericana,* where a limited number of youths are being educated at Company expense. *Escuela Agrícola Panamericana* will observe its formal inauguration ceremonies on October 12 of this year and this would seem to be an appropriate time to give an account of the work that is being conducted there.

The boys start learning English as soon as they reach the campus. This is a group of second-year students in English

In the summer of 1941 at a conference in the home office of the United Fruit Company at Boston, Samuel Zemurray, President of the Company, announced that the school of which he had dreamed for years was to become a reality. A spot was to be chosen, centrally located in Middle America, where students could live and work in precisely the sort of surroundings from which most of them would come and to which they would return. The school was to be equipped in the most modern fashion, and boys were to be sought who had unusual ability, boys of the humbler classes who would have to fight their way upward in the world. A sum of $500,000 was turned over for immediate use. The Board of Directors would consist of Mr. Zemurray as President, Thomas Barbour of Harvard University, Thomas D. Cabot of Boston, T. Jefferson Coolidge, formerly Assistant Secretary of the United States Treasury, and W. Latimer Gray of the First National Bank of Boston.

Río Yeguare Selected As Site

After some months of canvassing the field, an ideal site was selected in the valley of the Río Yeguare, about 20 miles from Tegucigalpa, the capital of Honduras. Here was an ample tract of land, at an elevation suitable for all tropical crops yet not uncomfortably hot, and with water available for irrigation as well as for domestic use. It is near enough to town so that we can get back and forth easily, but far enough away so that the boys are not tempted to think too much about the movies. The property belonged to the Government of Honduras, from which it was purchased. President Tiburcio Carías took a lively interest in the project and furthered its development in every way.

At one end of the farm was an abundant supply of volcanic tuff, which is excellent building material, and clay for making bricks and roofing tile. Back in the mountains within sight of the campus were forests of white pine. Harlo von Wald, a United Fruit Company engineer who had worked for years in the Tropics, took charge of the building program. Carpenters and masons were brought from Tegucigalpa and labor from the surrounding country, until 500 men were on the job.

The author is the Director of the Escuela Agrícola Panamericana and a collaborator of the Office of Foreign Agricultural Relations. As a former explorer for the Office of Foreign Plant Introduction of the U. S. Department of Agriculture and a member of the Lancetilla Experiment Station, of the United Fruit Company, which he helped to develop, he has had a wide opportunity to investigate the agricultural problems of Latin America.

Zemurray Hall, main building of Escuela Agrícola Panamericana, which was established by The United Fruit Company to provide Latin American boys with practical farm training

The style of architecture adopted is a slightly modernized Spanish colonial, which means heavy walls and lots of timber. It is an expensive style, but one that four centuries of experience have proved to be well adapted to this part of the world and able to stand for a century or more with little maintenance. When at the end of a year we ran out of money the Company appropriated another quarter of a million dollars.

Fifteen months after construction was commenced the school was ready to open. The original policy has been followed of offering all-inclusive scholarships, including transportation for boys who came from some distance and were unable to stand this expense, housing, food, clothing, tuition, and medical and dental service. There are no pay students.

Agriculture Is Emphasized

In selecting the students little stress is laid upon previous academic attainments. Of the 72 boys from seven republics with whom we began the work, some had had only the common or public school education provided by their respective countries; some had had secondary schooling up to the "bachillerato" or bachelor's degree. Training is limited almost entirely to subjects directly related to agriculture. The boys start learning English as soon as they reach the campus and in the first year they study mathematics and biology.

Most important of all, we put them in the field. Every morning they work in the vegetable garden or the dairy or with annual crops. Classroom work is limited to 3 hours in the afternoon. The system has worked remarkably well. The few who had not been used to manual labor have been carried along by the ones who had.

Many Applicants

By the beginning of the second school year, June 1, 1944, the school was swamped with applications for scholarships from every country between the United States and Chile. A most encouraging note was the fact that a half dozen of the first-year students wanted to have their brothers attend the school. About 50 new boys were taken in, bringing the total above 120 and the countries represented to 11.

Naturally, the teaching staff had to be increased. During the first year the staff had consisted of Alfred Butler, a British horticulturist who had been in the United Fruit Company for 16 years; Juvenal Valerio Rodríguez, formerly director of the National Museum of Costa Rica; and Augusto Arís de C., a young Guatemalan who taught the classes in English. To meet the expanded requirements Jaime Villegas from Colombia, and Juan José Carazo from Costa Rica were added to the staff. It is the policy to keep the teaching staff about half Latin American and half Northern.

The livestock and dairy department, which is supervised by Henry Hogaboom, another old Company employee, probably has become the most modern and best-equipped thing of its sort in Central America. We have a cold storage plant and a creamery for making butter and cheese; an excellent dairy barn; stables for breeding animals; a calf barn; a slaughter house; and extensive installations for chicken raising. On the other side of the campus are a nursery for fruit trees, economic plants in general, and a fine vegetable garden. In both these departments the boys do practically all the work and like it.

In promoting the school, the fact has been stressed that its graduates receive nothing but a diploma. Students are not wanted who are more interested in degrees or titles than in sound preparation for an agricultural career, and the school does not offer the sort of course which logically would lead to the conferring of a degree. Those students who, upon successfully completing the 3-year course, desire to specialize in some particular branch, such as soil surveying, dairying, or horticulture, will, however, be offered an opportunity to remain for a year of advanced work in their chosen branch and upon the completion of that training will be given a certificate in which is set forth an honest opinion of their qualifications.

Regents Select Students

The selection of students, upon which depends in large part the success or failure of our efforts, is the responsibility of a Board of Regents. The members of this group all live in the Tropics and represent a wide range of interests: Walter E. Turnbull and William L. Taillon are officials of the United Fruit Company; Doris Zemurray Stone is well known for her philanthropic interests in the development of the Central American republics; Fernando Castro C., of Costa Rica, and Luis Pedro Aguirre, of Guatemala, are prominent agriculturists; and Luis Landa, of Honduras, is a professor of botany.

The first group of students ranged from 16 to 21 years in age, and there were even a few who were more than 21. With occasional exceptions better results seem to be obtained with the younger boys. Entrance, therefore, is now limited to boys who have reached their 15th birthday but have not passed their 19th.

In summing up the results of the first year's work, mistakes have been made, but we hope we are correcting them. We believe in the soundness of the policy of having a certain percentage of trained teachers and a liberal percentage of trained tropical agriculturists with long practical experience. The staff represents a total of more than 100 years of agricultural experience in tropical America.

Teaching the boys the proper relationship between theory and practice is difficult. We do not want our boys to memorize theory and fail to recognize the relationship of what they have memorized with what they do in the field. To remedy that the teachers work directly with the boys in the field during their morning *prácticas* and we base theoretical explanations in the classroom on what they have recently been doing in the field.

The livestock department of the school is perhaps one of the most modern and best equipped in Central America

North wing of Zemurray Hall, housing the soil chemistry laboratories

During a discussion of the plans for the school last year in Washington, Vice President Wallace made the remark: "If you can teach the boys to work with their hands, you will have gone a long way." We feel that results along this line are more than gratifying. The fact that everyone, including the members of the teaching staff, gets out in khaki and takes his part helps to set the right spirit of cooperation. We wish to be sure that our school is a vocational school and that when the boys leave it they have not lost all desire to go back to the land and be plain dirt farmers. Training for white collar jobs is not an objective of the school.

We do not yet know what our boys are going to do when they leave the school, but we know what we want them to do. We want them to go back to their respective countries trained to be better agriculturists and better citizens. We want them, above all, to work their own farms, where they can put into practice what they have learned, and perhaps help others by their example. Some of them —and we think probably a good proportion—will get jobs helping others with less agricultural training run their farms. A few may become extension workers. If they work under wise governmental direction, they will accomplish much.

Escuela Agrícola Panamericana, on the occasion of its inauguration ceremonies, stands firm in the conviction that it can play a useful role. It can choose the human material with which to work; its aims are eminently practical; and it is entering life just at the time when there is a widespread awakening of interest in the development of tropical American agriculture.

Reading about the AMERICAS

Latin America and the Industrial Age, by J. Fred Rippy. 277 pp., maps. G. P. Putnam's Sons, New York; 1944. The author discusses the scientific and technological development of various republics in South and Central America and of Mexico, through the arrival of the steamboat, railway, airplane, telegraph, and telephone. Sanitation and medicine and rubber plantations are included in the discussion. Each chapter has an extensive bibliography.

Aesculapius in Latin America, by Aristides A. Moll. 639 pp., illus. W. B. Saunders Co., Philadelphia; 1944. A history of medical progress in Latin America, from the opening of the first infirmary at Santo Domingo in 1494 and the first hospital in 1504 to recent times. An appendix gives a chronology of diseases occurring in Latin America.

A Brief Review of Food and Nutrition in Five Countries. 28 pp. Issued by the War Food Administration, U. S. Department of Agriculture. U. S. Government Printing Office, Washington, D. C.; 1944. Five lectures delivered in Washington soon after the United Nations Conference on Food and Agriculture at Hot Springs, by five delegates to the conference. With lectures on the nutritional problems of Egypt, Belgium, China, and India is the one given by Dr. Francisco DeP. Miranda, Director of the National Institute of Nutrition of Mexico, entitled "The Economics of Mexican Nutrition."

Our Latin American Neighbors, by Harriet McCune Brown and Helen Miller Bailey; Clarence H. Haring, editor. 471 pp., illus. Houghton Mifflin Co., Boston; 1944. Although designed primarily for high school use, this book has much of interest for older readers as well. The geography and history of Latin America are explained, and the various republics are discussed. One chapter tells of the Latin American contributions to American culture, and a combination index, guide to pronunciation, and glossary is given. Several chapters have extensive reading lists.

Panamá en la economia mundial de la postguerra, by Richard F. Behrendt. 9 pp. Republic of Panama, Panama; 1944. An address in Spanish dealing with the future of Panama in the world's economy. It calls for cooperation with the United States.

On the Threshold of World Order, by Vera Micheles Dean. 96 pp. Foreign Policy Association (Headline Series No. 44), New York; 1944. A discussion of international relations which may emerge from the war, with special reference to the British Commonwealth, Russia, Germany, and the Far East. Included is a short chapter on "Testing our Intentions in Latin America," which deals with the question of continuing inter-American cooperation.

Maryknoll Missionary Letters. 5 volumes. Field Afar Press, New York; 1942-44. Some chapters in each of these books are devoted to letters from Maryknoll Missioners in other American republics and describe local conditions at first-hand.

Mechanical Properties of Certain Tropical Woods, Chiefly from South America, by William Kynoch and Newell A. Norton. 87 pp. University of Michigan, School of Forestry and Conservation, Ann Arbor; 1938. The authors deal with test results on mechanical properties of nearly 40 tropical woods, mainly South American, with special sections on the structure and mechanical properties of 5 of the Latin American hardwoods.

Virus Diseases in Man, Animal and Plant, by Gustav Seiffert; translation by Marion Lee Taylor. 332 pp. Philosophical Library, New York; 1944. Among other things, this book deals with yellow fever and other tropical diseases. Under each disease, a valuable reference list is given.

Bibliography on Labor and Social Welfare in Latin America, compiled by Sylvia Pollack Bernstein. 76 pp. (processed). Pan American Union, Washington, D. C.; 1944. A bibliography of materials in English published from 1930 through December 1943 on labor and social problems in the Americas.

História Natural do Brasil, by Jorge Marcgrave. 293 pp. + index, illus. Imprensa Oficial do Estado, São Paulo, Brasil; 1942. George Marcgrave, said to be the first student of American natural history, sailed from Holland for Brazil in 1638. The notes which he kept were edited and published in Latin in 1648 under the title *Historia Naturalis Brasiliae* by João de Laet. The present volume is a translation of that book into Portuguese by Dr. José Procopio de Maghães. It is a fully illustrated study of the plants, fish, birds, quadrupeds and snakes, insects, the human inhabitants, and diseases of the north eastern part of Brazil.

The Fruit Industry of Mexico, by Fred A. Motz and Lester D. Mallory. 184 pp. (processed), illus. Office of Foreign Agricultural Relations, U. S. Department of Agriculture, Washington, D. C.; 1944. Foreign Agriculture Report No. 9. An extensively illustrated study of the fruits of Mexico—citrus, tropical, and deciduous—and the cultural practices, markets, and marketing methods of Mexico.

Editor's Note.—The listing of publications here does not necessarily imply an endorsement of them by the Department. For copies of private publications, write direct to the publishing agency given in each case.

THE RIVER BASINS OF LATIN AMERICA

(Continued from page 166)

and livestock, forest products, cotton, sugar, tobacco, cacao, babassú and many other agricultural products come from this vast system.

Another Brazilian river flowing into the Atlantic is the São Francisco. The valley is between two ridges and parallel to the east coast of Brazil until it breaks through to the coast south of Maceió, just south of the bulge. This river is characteristic of most Brazilian rivers in leaving a broad and well-graded valley on the top of the plateau and passing to the lower-lying lands in a series of steep cataracts which betray the relative youth of this section. Within the basin are found: livestock ranching without forage crops; production of sugarcane, cotton, rice, tobacco, coffee, cacao, coconuts, manioc, beans and fruit; and—what is most important—a tremendous supply of potential water power.

North of the São Francisco and east of the Amazon lies the northeast drainage basin. In the western part of this basin the rivers have a steady flow, but those in the eastern part become practically dry during droughts.

Of all the rivers of South America, the Amazon, the Paraná-Paraguay or La Plata, and the Orinoco account for the greatest part of the drainage of this continent.

WEST INDIES

More than half of the land area of the West Indies is in Cuba. Although various sections of the coast are swampy, most of Cuba is well drained by many short rivers and produces a variety of crops, such as sugarcane, tobacco, coffee, bananas, Indian corn, oranges, and other tropical fruits. In none of the other islands of the West Indies—Hispaniola (Haiti, and Dominican Republic), Puerto Rico, and the British possessions of Jamaica, Trinidad, and the Barbados—are there any rivers of great significance.

Within the river basins of Latin America exist tremendous undeveloped resources: a large potential supply of water power; supplies of minerals and metals; strategic commodities in large quantities, such as nitrate deposits in Chile, tin, wolfram, and lead in Bolivia, oil in Venezuela, gold and silver in Mexico; important agricultural commodities, such as wheat, corn, linseed, cattle, hides, and wool in Argentina; the world's largest and richest supply of iron ore, as well as forest products, rubber, cotton, nuts, and coffee in Brazil; copper in Peru; and plenty of sugar in Cuba and Puerto Rico. These are by no means the full list of the great variety of resources the Latin American region offers to the world. In addition, a great area, through the aid of irrigation by the use of stream diversion and large dams, will become suitable for agriculture.

The development of these great basins is already under way. The population pattern is changing somewhat from the established cluster type to one more widely distributed, and improvement in transportation and other factors closely associated with this pattern are taking place. Most of this region with its small population and enormous natural resources is one of the areas of the world which holds high possibilities for future development.

MEXICO AND THE UNITED STATES DISCUSS MUTUAL FARM PROBLEMS

(Continued from page 171)

the field and report at the next meeting on any problems which would be of concern to the Commission.

7. The exchange of scientific and technical information. The point was made at the conference that the direct exchange of scientific and technical data resulting from experimentation and research is of great advantage to fellow scientists, and that it often makes the results of such work available a year or more in advance of formal publication. For that reason a standing committee was designated to promote and encourage an exchange of information between United States and Mexican scientists. To facilitate the work, lists of pertinent projects and investigations will be exchanged, together with the names of the investigators and the places where the investigations are being made.

8. The training of professional personnel. The meeting emphasized the need for selecting promising scientists or students in each country for special training in predetermined technical fields based on the needs of the country. The Commission agreed that when special training is taken in a foreign country it should be concentrated at the post-graduate level. The men selected for such special training should receive their basic under-graduate training in their own country. The Commission designated a standing committee to survey current programs of this character, the needs of each country and the opportunities available.

Greater uniformity in economic statistics was another subject emphasized by the Commission. The Mexican section proposed in that connection to send Señor Ing. Gonzalo González, Director General of Rural Economy, together with a number of associates, to the United States to study prevailing methods of gathering, processing, and reporting statistics. The United States section welcomed and approved the proposal and gave assurance that every effort would be made to cooperate with the Mexican government in that direction. While in the United States Señor González will also make preliminary investigations with regard to the question of uniform standards and grades for agricultural products for the export market.

In retrospect, two highly significant results were accomplished by this meeting of the Commission. The members of the two sections became mutually acquainted and established bonds of personal friendship and understanding. Secondly, the Commission got into the real substance of its work. Among the problems explored and among the

(Continued on page 178)

ALONG THE *Agricultural Front*

▲ Costa Rica to Establish Cinchona Plantation

A recent important agricultural development in Costa Rica was the passing of a law which granted under contract to the Defense Supplies Corporation the use of 3,088 acres, to be increased later to 4,940 acres if necessary, for the establishment of a cinchona plantation. The contract is for a period of 25 years. During this period the Defense Supplies Corporation, or its successors, will have complete control of the property. The contract also says that the Corporation shall be exempt from national and municipal taxes and there shall be no increase in existing export duties by the Costa Rican Government on any part of the cinchona development or on any products produced from it for antimalarial purposes. No monopoly is implied by the contract, and any organization or individual is free to plant cinchona for commercial purposes.

▲ U. S. Is Principal Buyer of Nicaraguan Peru Balsam

The United States is Nicaragua's principal customer for balsam of Peru, which is used in large quantities as a medicinal and as an ingredient in perfumes. Because of its antiseptic power, this product is in great demand for treating surface wounds.

Prior to the war, Germany consumed most of Nicaragua's output of Peru balsam and in the peak year of 1939 some 41,000 pounds were reported to have been exported. During the past few years shipments on the whole have been stable, although they declined in 1943. Production is entirely for export, and larger amounts would be shipped now if labor were not concentrated in the rubber industry. Annual post-war shipments may average about 35,000 pounds, which amount could undoubtedly be doubled if all available trees were tapped.

▲ New Paper Mill Planned For Medellín, Colombia

The erection of a new paper mill in Medellín, Colombia, with branches in Cali and Barranquilla has been announced recently. The name of the new mill will be "Carton de Colombia S.A.", and a number of Colombian capitalistic groups are reported to be backing the enterprise.

The capital of the company is reported to be $428,500, which will be increased eventually to $1,140,000.

▲ Grain Elevator Project Is Begun in Brazil

A cooperative grain elevator construction project has been undertaken by the *Servico de Fiscalizacao de Comercio da Farinha,* a division of the Brazilian Agriculture Ministry in charge of production and storage of cereals, with the assistance of technicians from the United States.

The new project, which is expected to prove of great aid to the Brazilian grain industry, includes three types of elevators—concrete, brick, and wood. A series of these elevators, having a storage capacity of approximately 250 tons each, will be built in the State of Rio Grande do Sul, the leading wheat-producing district of Brazil.

The new elevators have been designed especially to prevent damage by insects. It has been estimated by those in charge of the project that the series of elevators will be adequate to store an entire year's crop, thus eliminating the necessity for shipping surplus grain to the north and of later importing grain to keep the mills of the Rio Grande in operation.

Neither brick nor wood, apparently, has ever been used in grain elevator construction in Brazil before. However, use of these materials is expected to greatly facilitate construction, as both wood and brick are plentiful and cheap in Rio Grande do Sul.

▲ New Fish Hatchery Established in Bolivia

The new national fish hatchery at Pongo, Bolivia, was completed and officially opened for use this spring. It is hoped that, by stocking lakes and rivers with fish from the new hatchery, Bolivia will soon be self-supporting in this important food item.

▲ Modern Sawmill Planned For Yaracuy, Venezuela

Plans have been announced by a lumber concern in the State of Yaracuy, Venezuela, for the construction of a modern sawmill in connection with the development of its mahogany stands. Lumber from the mill will be supplied to the Federal District, where there is said to be a substantial demand for material for construction purposes. Workers employed on the project are to be furnished with prefabricated houses.

▲ Substitute Oils Find Use in Brazil

Brazil, formerly a large importer of olive oil, is developing the use of several substitute oils and has found that they meet domestic needs in many instances. A large part of the substitution comes from peanut oil and cottonseed oil. Babassú oil is now being used on the domestic market in the production of soap, and castor oil has found a new use as a motor fuel. Babassú oil and kernels are also being exported along with ouricury kernels and wax, tucum kernels, oiticica oil, and murumuru oil.

▲ Bolivian Women Work as Rubber Tappers

Rubber production is expanding so rapidly in Bolivia that in some regions women are employed as rubber tappers, and in others women and children are helping the men in a number of operations, according to the latest Department of Commerce report. Until recently men have done all the tapping of wild rubber trees.

Efforts to obtain additional workers for the production of rubber in Bolivia are expected to increase and by the end of this year 8,000 gatherers should be employed. At the present time there are approximately 6,000.

MEXICO AND THE UNITED STATES DISCUSS MUTUAL FARM PROBLEMS

(Continued from page 176)

projects laid out for immediate attention are many which are fundamental in the agricultural relationship of the two countries. In the minds of both sections, the Commission is well on its way as a coordinating and guiding body to strengthen and expand in agriculture the already well-established cooperation and friendship between the two countries.

NEW TIES ACROSS THE BORDER

(Continued from inside front cover)

appreciated by people in my country."

Mr. Wickard also referred to the cooperative efforts now under way in Mexico to investigate rubber production problems and the mutual aid that is being given in the field of agricultural engineering.

Under the various cooperative projects the Secretary particularly praised the work that is being carried on in exchange of students and technical experts. He said that during the past 4 years, twelve agricultural specialists from Mexico have worked with various branches of the U. S. Department of Agriculture, more than from any other Latin American country. He did express regret, however, that only eleven Mexican students had availed themselves of the opportunity to study agriculture in the colleges and universities of the United States.

Secretary Wickard emphasized the importance of developing more fully the possibilities of complementary agriculture. He pointed out that Mexico, like other countries in the tropical Americas, raises agricultural products which the United States wants and needs. Mexico, in turn, he stated, needs industrial and farm products from this country. "The progress which we can make through joint research toward more efficient agricultural production," he said, "will make for an increased volume of the kind of trade both countries desire so sincerely. It will also make for better living in both countries, both on farms and in cities."

In closing his address Mr. Wickard declared: "At these meetings here this week we are taking a long step toward consolidating the many lines of cooperation already developed, and are broadening the foundations for greater agricultural cooperation in the future. The work of this Commission may well be the starting point of far reaching contributions to the well being of Mexico and the United States.

MEXICO

(Continued from inside back cover)

Although hogs and other minor livestock exist in great numbers, cattle provide most of the meat for domestic consumption. About 500,000 head of beef cattle are exported each year, practically all to the United States. Cattle are scattered fairly well over the country, but the cattle for export are all from the northern States.

Since the war began, the Mexican Government has encouraged the increased production of agricultural products, particularly oilseeds, to relieve the deficit caused by shutting off supplies from the Far East. In 1942 the Government adopted a plan, *Plan de Movilización de Agricultura,* for increasing production throughout the Republic, particularly of food crops for domestic consumption. Weather hazards resulted in an actual production substantially different from the goals established under that plan. Again, in the fall of 1943, plans were made to increase corn acreage in all parts of the country and expand the production of sugar.

Where our men are fighting
OUR FOOD IS FIGHTING
FOOD
BUY WISELY – COOK CAREFULLY – STORE CAREFULLY – USE LEFTOVERS

AGRICULTURE IN THE AMERICAS O. R. CARRINGTON, EDITOR

A monthly publication of the Office of Foreign Agricultural Relations of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 10 cents per copy, or by subscription at rate of 75 cents per year, domestic; $1.20 per year, foreign. Postage stamps will not be accepted in payment.

MEXICO

The Republic of Mexico, separated from the United States by the Río Grande River, has an area of 764,000 square miles or approximately one-fourth that of continental United States. About two-thirds of this area is a vast Central Plateau, attaining its greatest height near Mexico City and sloping gradually to the north. Two mountain ranges form the east and west borders of the Plateau—the Sierra Madre Oriental on the east, a continuation of the highlands of Texas, and the Sierra Madre Occidental, extending along the western side from the highlands of Arizona. Three of the world's highest volcanoes—Orizaba, Popocatepetl, and Ixtaccihuatl—rise from the Plateau, and the world's newest volcano, Paracutín, is making "a mountain out of a corn field" in the State of Michoacán. Between the mountains and the sea on either side are narrow coastal plains. The two peninsulas, Baja California and Yucatán, are lowlands. Mexico has 1,600 miles of coast line on the Gulf of Mexico and 4,200 miles along the Pacific, including the Gulf of California. Few of the rivers are navigable for any distance because of their swift currents. The widest is the Río Grande, or Río Bravo as the Mexicans call it, and the most important is the Panuco, which carries oil to the seaport Tampico.

Climate

In common with other countries of the Tropics and Subtropics, Mexico's temperature is determined largely by altitude. The lowlands, below 3,000 feet, are generally hot; the middle altitudes, between 3,000 and 6,000 feet, have a temperate climate; and the highlands above 6,000 feet are cold. The range of temperature thoughout the year is great in northern Mexico; in the higher altitudes of the Central Plateau the temperature is relatively uniform throughout the year.

Rainfall varies widely from one region to another and from one season to another. On the Sonora desert, for example, annual rainfall averages only 2 inches, whereas in the tropical lowlands it averages 185 inches. Most of the rain falls from May through September with little precipitation during the remainder of the year. Lack of sufficient moisture in many places and poor distribution of rainfall combine to create one of the major problems of the Mexican farmer.

People

Most of Mexico's 20,000,000 people (19,653,552 according to the 1940 census) live on the Central Plateau. Although Mexico City, the cosmopolitan capital, has well over a million people and other interior cities and port towns are thriving industrial centers, almost 80 percent of Mexico's people depend on agriculture and other rural industries for their livelihood. Nearly 33 percent of the people are pureblood Indians, about 60 percent are Mestizos or mixed races, and something less than 10 percent are white.

Mineral Resources

From the standpoint of trade Mexico's mineral wealth is its most valuable resource, forming three-fourths of all exports from the country in terms of value. Mexico has produced more silver than any other country and has been the greatest exporter of this metal. It is also an outstanding producer of lead and petroleum, and its mines furnish copper, iron, zinc, tin, mercury, antimony, bismuth, tungsten, molybdenum, manganese, cadmium, selenium, arsenic, amorphous graphite, platinum, and gold. A significant share of world supplies of several of these minerals and many strategic minerals necessary to the United Nations in the war effort come from Mexico.

Forest Resources

Forests cover more than one-seventh of Mexico's land area, although the best woods grow along the coasts and in the southern states. Oak, pine, fir, cedar, spruce, and balsam are cut primarily for the domestic market, but ebony, mahogany, sandalwood, and rosewood are produced for both the domestic and export markets. The most important forest product for export, however, is not wood but chicle, used as the basis for chewing gum. Mexico supplies most of the chicle that enters world trade. Other valuable forest products are: Copra, used in the manufacture of coconut oil for home consumption; camphor; copal; coquito palm oil; *zacatón* root, used to make coarse brushes; and dyewoods. Guayule rubber, although not a forest product, grows wild on the deserts of Mexico and is a valuable resource. It has become particularly important since the war started.

Agriculture

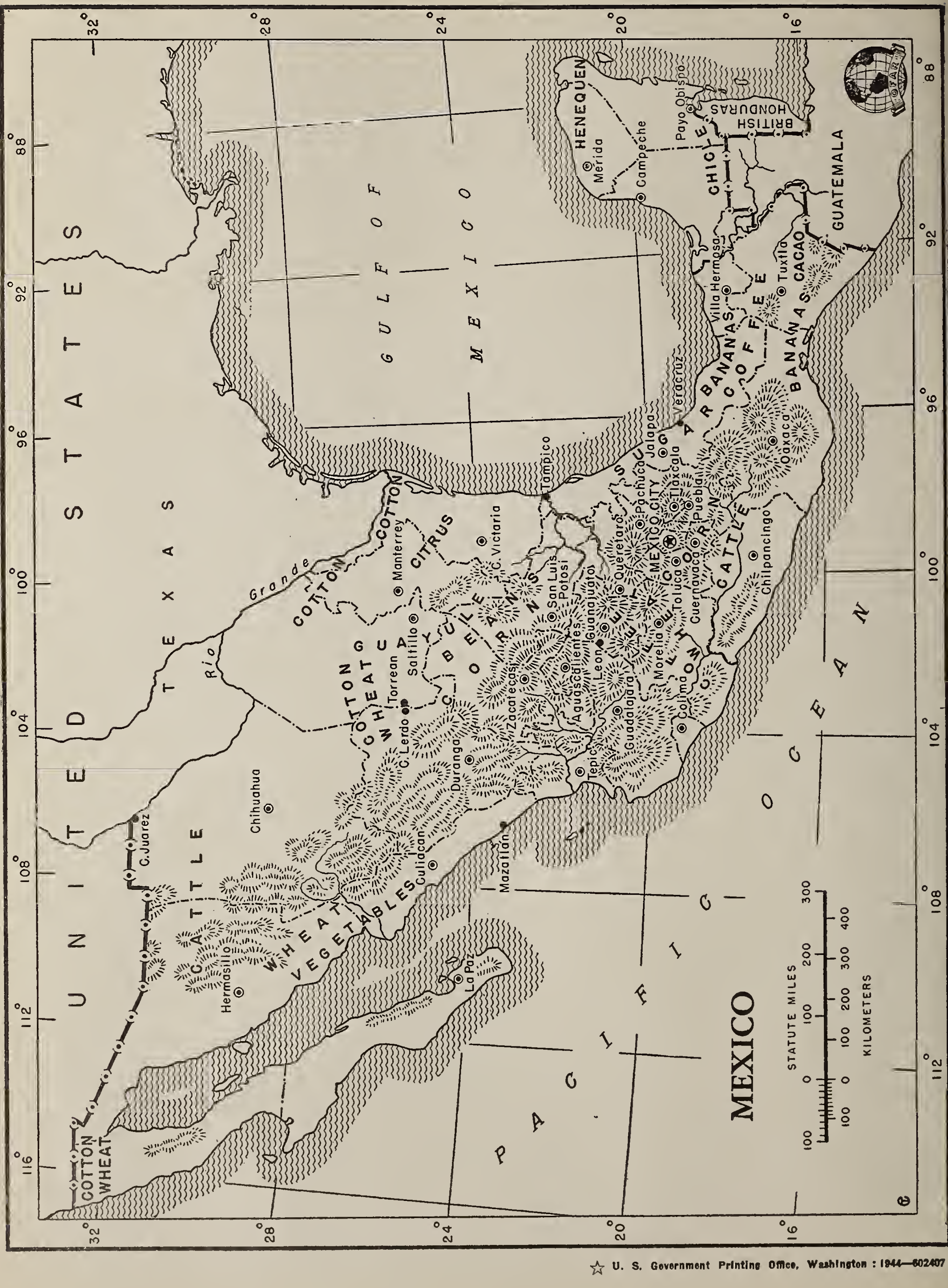
With roughly half of its area in the Tropical Zone and half in the Temperate, and with wide variations in topography, Mexico provides climatic and soil conditions for a wide variety of foods and fibers as well as for rare and exotic products. Food crops—grains, vegetables, fruits, sugarcane—are grown for use within the country. Henequen and other fibers, winter vegetables, cattle, vanilla, and fruits go into export trade, many of them to the United States.

Corn, the principal staple food, and beans constitute the two major items in the Mexican diet. Although corn is grown in every State in Mexico, about 80 percent of the total crop is grown in the temperate areas of the Central Plateau. Corn and beans are usually planted together in the same field. The center of the wheat area is north of the principal corn-growing region, much of the wheat being raised on irrigated lands. The warm interior valleys and the southeast coast, particularly the State of Veracruz, are the sugarcane areas, and the bulk of the bananas, one of the most important fruits, grows in Chiapas, Veracruz, Oaxaca, and Tabasco.

Rice is usually produced in sufficient quantity for export, the largest harvests being in the State of Sonora, where the rice is grown under irrigation. Much of the world production of henequen is in Mexico, in the lowlands of the Yucatán Peninsula. Henequen has been Mexico's most important agricultural export in terms of value for many years and is now in more demand than ever as a strategic wartime commodity. Vegetables, particularly tomatoes, produced in the west coast States of Sonora and Sinaloa, are exported to the United States to supplement the winter vegetable supply.

Many other agricultural products are grown throughout Mexico, including barley, oats, rye, cacao, vanilla, coffee, and spices, as well as numerous fruits such as pineapples, mangoes, papayas, apples, figs, dates, and citrus fruits.

(Continued on page 178)



MEXICO

☆ U. S. Government Printing Office, Washington : 1944—602407

752A
cp 2
Curr

Agriculture IN THE Americas

Issued Monthly by the OFFICE OF FOREIGN AGRICULTURAL RELATIONS
UNITED STATES DEPARTMENT OF AGRICULTURE

LIBRARY
CURRENT SERIAL RECORD
OCT 25 1944
U. S. DEP

IN THIS ISSUE

	PAGE
Protection From Insects	183
Curare—Poison and Medicine	186
Growing Bananas on Acid Soil	188
4-H Clubs in the Americas	190
Along the Agricultural Front	197
Gifts of the Americas—The Sapodilla	198
The Amazon River Basin	199

October 1944

NAMES & NEWS

Mexican Educator Is Visitor

Professor Guillermo Bonilla Segura, Head of the Department of Cultural Missions of the Mexican Ministry of Education, is in the United States, at the invitation of the Department of State, observing rural education and agricultural extension programs.

Cultural missions were first organized in Mexico nearly a quarter of a century ago for the purpose of recruiting and training teachers. Suspended in 1938, the missions were resumed in 1942 under a new plan which, in addition to teacher training, included assistance to industrial workers, especially in mines and textile mills, and supervision of the education and living conditions of the Indians who form a large part of the population of Mexico.

Professor Bonilla Segura says that the Indian missions are carrying out a five-point program. The program includes provision for: Public health, with emphasis on malaria control; preventive measures against endemic disease; improvement of hygienic conditions in the home; family life—its dignity, and the importance of sharing responsibility; recreation, including swimming, folk dancing, etc.; and education to improve the general economic standard of the farm and home.

●

Office of Foreign Agricultural Relations Names New Branch

Leslie A. Wheeler, Director of the Office of Foreign Agricultural Relations, has announced the establishment of a Technical Collaboration Branch, which is designed to accommodate an expanding technical program and which supersedes the former Division of Latin American Agriculture. The new Branch will be responsible for administering and facilitating those technical activities of the Office of Foreign Agricultural Relations that are conducted collaboratively with other governments.

Ross E. Moore, formerly Assistant Director of the Office in charge of Latin American work, has been named Chief of the Branch, and Ralph H. Allee has been designated Assistant Chief.

Mycologist From Mexico

Dr. Antonio González Ochoa, prominent Mexican mycologist, is visiting this country to carry on special studies and research in his chosen field. His itinerary will include conferences with specialists in tropical medicine at Duke and Stanford Universities, and at the National Institute of Health, in Bethesda, Md.

Dr. González Ochoa is Chief of the Laboratory of Mycology at the Institute of Public Health and Tropical Diseases in Mexico City. He has made many valuable contributions to present information on mycology, the study of fungi, and the methods of combatting diseases arising from fungus infections. He is especially interested in *Coccydiodomycosis,* a serious fungus infection which often attacks the lungs.

●

To Study Vocational Agriculture

Señor Alejandro Hernández, Director of the Normal School for Vocational Agriculture Training at Buga, Colombia, arrived in this country recently to pursue courses in vocational agricultural training under the Institute of Inter-American Affairs. Following training in the English Language Institute at the University of Michigan, Señor Hernández will enroll in some North American university for work in vocational agriculture.

●

Two Students From Colombia

Señor Antonio María Penate Pérez and *Señor Alvara Chaparro Gonzales,* of Colombia, have arrived in the United States for a year's study in agriculture. They have received fellowships from the U. S. Department of Agriculture, where they will study the organization of the Extension Service with a view to establishing a similar service in Colombia. Señor Penate is interested in farm management and cotton culture, while Señor Chaparro will study soil conservation and rural sociology.

●

Goes to Nicaragua

Lewis E. Long, agriculturist in the Office of Foreign Agricultural Relations, has gone to Nicaragua, where he will organize and supervise an extension program for the Cooperative

(Continued on page 195)

Agriculture IN THE Americas

Vol. IV. · OCTOBER 1944 · No. 10

Protection From Insects

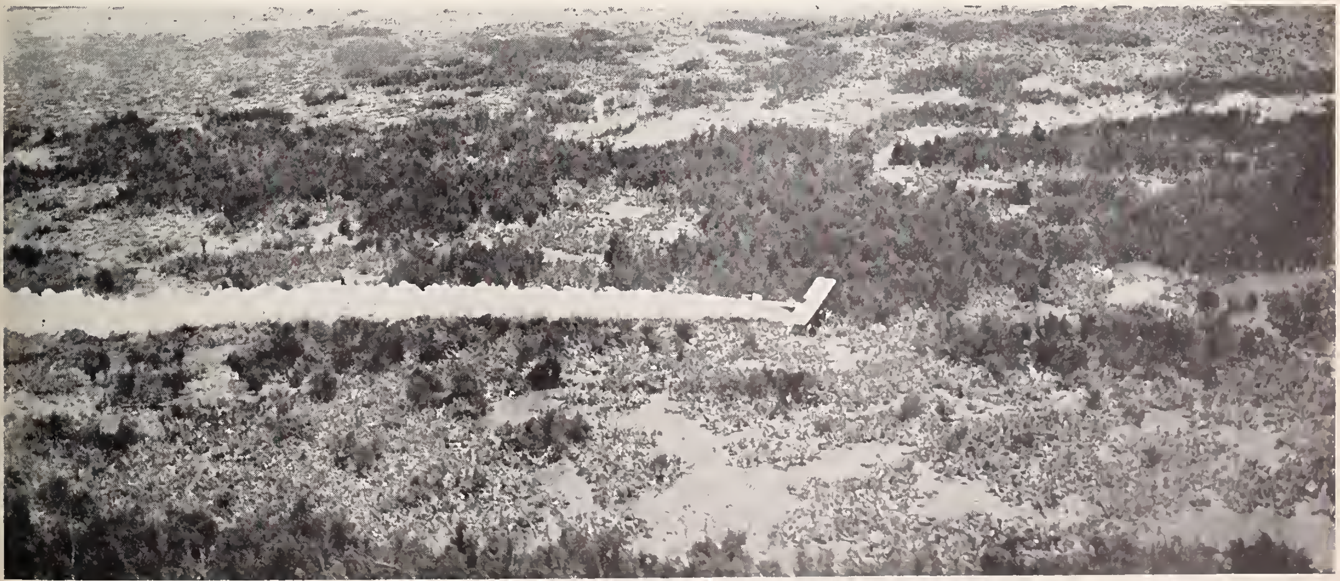
Many insects reduce agricultural production by annoying farm workers and transmitting diseases to them. The following article describes much that may be done to check this loss.

by **F. C. BISHOPP**

Insects provide one of the most serious problems for those who follow agriculture, not only because they are destructive to crops but because their attack on livestock and the farm workers themselves is both annoying and dangerous. Many of the insects, especially mosquitoes, ticks, and mites, carry debilitating and deadly diseases, and for this reason protective measures must be taken against them. Inasmuch as many of the measures recommended are too expensive for the tax program of most rural areas, protection against the insects becomes a problem for the individual.

Chiggers and Ticks

Chiggers or redbugs (not chigoes) are young mites that attach themselves to various birds and animals, including snakes and lizards. They are among the most annoying insects and are found in Mexico, Central and South America, the West Indies, and the southern part of the United States. They do not penetrate the skin, as is popularly believed, but attach themselves to it and engorge themselves with blood. After they have had their fill of blood, they drop off in a few days and in subsequent stages appear to be entirely harmless, since they seem to live only as scavengers. While attached to the body, young mites apparently inject an irritating secretion which sets up a persistent

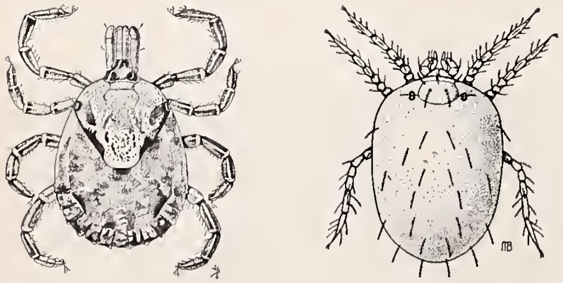


The airplane has been found effective for dusting large breeding areas in swampy regions.

itching, causing the sufferer to scratch. This may result in a serious secondary infection. Chiggers are not known to transmit any disease in the Western Hemisphere but in the Orient they may infect man with an organism that causes the rather severe disease known as scrub typhus or Japanese river fever.

Workers may obtain much protection by wearing closely woven trousers that enter the tops of boots or leggings and by the application of sulfur to the clothing and skin. Keeping the grass, weeds, and underbrush cut closely and dusting infested areas with finely ground sulfur at the rate of 400 pounds per acre also give good results. The best protection against chiggers is through applications of the repellents dimethyl phthalate, Rutgers 612, or Indalone as a barrier along the inside of the cuff of the trousers or to other openings in the clothing. These repellents were developed recently in cooperation with industry, and since then the U. S. Bureau of Entomology and Plant Quarantine has found that a mixture of 6 parts of dimethyl phthalate, 2 parts of Indalone is more effective for repelling various pests than either of the ingredients used alone. Unfortunately, these repellents are not available for civilian use at the present time as there is great demand for them in the various armed services.

The tick is another bothersome insect. The young or seed ticks and nymphs of several species, especially the Cayenne tick, are present in incredible numbers in brushy fields. The bite is persistently irritating and may afford points of entry for infection from Rocky Mountain spotted fever, Brazilian tick fever, or tularaemia.



Two of the most bothersome insects—the Cayenne tick (left) and the chigger or redbug (right).

Control of ticks should start with the wild and domestic animals from which they secure the blood to develop and reproduce. In domestic animals this may be accomplished by developing improved pastures, keeping all animals fenced in, and dipping them regularly for the control of the tick under question. Destruction of wild animals, especially the small rodents, may be advisable in some instances.

Agricultural workers may secure considerable protection from ticks by wearing high-top shoes laced over the bottom of the trousers. A rag soaked in kerosene and tied around the top of the shoes will also help. Repellents such as have been mentioned for chiggers may be used as a spray on clothing below the knees. Grass and weeds about the premises should be kept cut or sprayed with 1.5 percent sodium fluoride and 0.5 percent nicotine sulfate in water when ticks are especially abundant.

Fleas

Fleas are an ever-present source of annoyance in many tropical countries and are a potential disease hazard since they may transmit endemic typhus and bubonic plague. One of the species known as the chigoe has the vicious habit of burrowing into the skin, particularly on the feet, where it produces severe irritation that often leads to secondary infection.

As nearly all fleas breed in association with animals, control must be started with the animals and their sleeping quarters. The most valuable insecticide for destroying fleas on cats, dogs, and hogs is cube or derris powder, the finely ground dried roots of which come from tropical America. A level teaspoonful of this powder distributed along the skin on the back of a large dog will kill every flea present. Treatment should be repeated frequently, as often as every 2 weeks, as animals soon become reinfested. Animals should not be permitted to go beneath houses, and their outdoor sleeping places should be sprayed occasionally with creosote oil, taking care not to let any of the oil get on animals or plants as it will burn them. Creosote oil is highly effective in destroying the larvae or maggots that develop in the cracks or dust of buildings.

Pyrethrum powder, made by grinding the flowers of pyrethrum which are grown in many tropical areas, not only may be used to destroy fleas on domestic animals but may be applied to bedding and clothing to prevent flea attacks on man. Other repellents already mentioned also offer protection against fleas.

Infestations of the chigoe flea may be controlled by wearing shoes and by spraying the soil with creosote oil where infested animals sleep. After chigoe fleas have entered the skin, however, they must be removed surgically under aseptic conditions. Some of the local people of South America have become adept at this practice.

Many Species of Mosquitoes

Mosquitoes are one of the most annoying and most dangerous pests. These include, in the Tropics, the malaria-bearing mosquitoes that consist only of certain species of *Anopheles;* the yellow fever mosquito, which abounds close to habitations; and the so-called pest mosquitoes, certain species of which are now known to transmit encephalitis or brain fever to man.

Representatives of the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, are working constantly to discover new and more efficient methods for the control of insects. Illustration shows tests being conducted with various mosquito repellents in a marshy field.

Malaria is most prevalent in warm, temperate, and tropical regions, and its debilitating effect has been so great as to have prevented agricultural development of some of the most productive areas of the world. Other areas which had been brought to a high state of cultivation have been permitted to revert to primitive conditions when adequate attention was not given to mosquito control. In most areas mosquito control is expensive, and too frequently the agricultural population has not been sufficiently impressed with its importance.

The *Anopheles* or malaria-bearing species of mosquitoes have diverse breeding habits. This makes it important to determine accurately the particular species involved so as to map an adequate control program. Elimination of breeding places is one of the first essentials, as malaria mosquitoes do not travel great distances. This may involve expensive drainage operations, the deepening and straightening of the edges of ponds and lakes, use of larvicides, and the elimination of such man-made breeding places as burrow pits and poorly drained roadsides.

Where drainage is impractical, larvicides should be used. Insecticides in dust form may be used to kill the wigglers of the malaria mosquitoes as they feed at the surface of the pools in which they breed. Paris green is effective for this purpose, used at the rate of 1 pound to 9 parts by weight of soapstone or other dust per acre. Applications are usually effective for only a week or 10 days, so they should be repeated frequently during the breeding season. Fuel oil No. 2 and kerosene also are effective larvicides and are applied to the surface of the water at the rate of 15 to 30 gallons per acre. Crankcase drainings, with kerosene, 3 parts to 1 of oil, are effective and often cheaper. Any one of these is effective only for from 7 to 10 days.

Airplane Is Effective

Mosquito larvicides are applied in a number of different ways, the airplane being most effective for dusting large breeding areas. For smaller areas and along the shores or borders of lakes, dusts or oils may be applied with a sprayer or dust gun from a boat.

(Continued on page 192)

The author is Assistant Chief of the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture. He is internationally known as an authority on veterinary and medical entomology and is author of a number of books on the subject.

Curare—Poison and Medicine

"For even thither had Odysseus gone
on his swift ship to seek a deadly drug,
that he might have wherewithal to smear
his bronze-shod arrows." .... **Homer**

"Next him, the huntsman, Amycus he kill'd
In darts invenom'd and in poison skill'd."
.... **Virgil**

by J. GORDON LEAHY

Indications that our words for poisons, bows, and arrows are derived from the same Greek root *tox* are shown in the English words toxin, meaning poison, and toxophilite, meaning one skilled in archery, and in the Hellenic word *toxon,* meaning bow. The above quotations further indicate that arrow poisons were known to the ancients long before Claudius told about those of the Ethiopians.

African arrow poison is still being made, in some parts of Nigeria, from *Strophanthus sarmentosus,* which was introduced into Florida as a pergola vine in 1927. However, the South American arrow poison, which was first mentioned in the English language in 1596 in Richard Hakluyt's description of Sir Walter Raleigh's expedition to British Guiana, is curare, a poison even now used on blowgun darts in sections where ammunition and shotguns are difficult to obtain.

Curare is an extract made from woody lianas (climbing plants) that grow in South America. It is natural that the dart poisons, or curares, vary in different parts of the continent because the plant world varies in the different areas where they are made. In Peru, along the Río Huallaga, the Chazuta Indians made curare from plants belonging to the *Menispermaceae* family. In Ecuador the Canelo Indians used the same plants—*Chondodendron tomentosum* and *C. iquitanum.* Farther east it was the *Strychnos* bushropes that made up the chief components of curare.

Botanical Ingredients

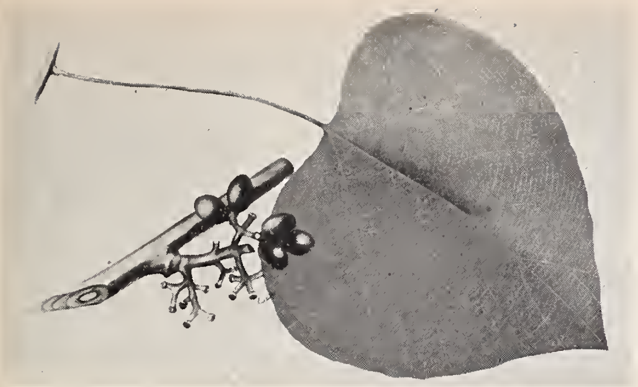
The botanical ingredients of one of the curare poisons were first established by Sir Richard Schomburgk in 1835, when the Macusi medicine men of British Guiana showed him the "wourali" bushrope, to which he gave the name *Strychnos toxifera.* Von Martius, German botanist, investigated some of the Brazilian curares made on the Amazon tributaries. Castelnau, a French botanist in 1846, and João Barbosa Rodrigues, a Brazilian botanist many years later, made fresh discoveries concerning the components of certain curares, and Barbosa Rodrigues, among others, pointed out that the *Strychnos* plants, contrary to the common belief, were not the only effective ingredient in curare. Through the years many scientists have worked to collect and classify the botanical components of the curares made by the different tribes of Indians.

To date, the following species of *Strychnos* have been found to be used in making curare: *Strychnos castelnaeana, S. guianensis, S. toxifera, S. solimoesana, S. yavariensis, S. jobertiana, S. peckii, S. pedunculata, S. mitscherlichii, S. subcordata, S, cogens, and S. melinoniana.* Besides these, mention should be made of *S. gubleri, S. japurensis,* and *S. triplinervia,* the status of which is doubtful. The first three are the most important ones.

The first of these, *Strychnos castelnaeana,* belong to the small-flowered section of *Strychnos.* In Brazil it has been found on the gentle slopes of the *restinga alta* along the Javari, Solimões, and Içá rivers and is called *guré* by the Ticuna Indians. This is one of the smallest of the *Strychnos* bushropes, being about 1.5 inches in diameter and 30 to 40 feet long. Its leaves are five-ply nerved, broadly ovate, and dull, with a rusty color beneath. They are from 6 to 11.8 inches long and from 2.7 to 8.2 inches wide. The flowers usually bloom in November and December, and the plant bears globose berries about 0.8 inch in

---

Mr. Leahy is a member of the International House, Philadelphia, and of the American-Brazilian Association, Inc., New York. He has spent 17 years in research and public relations work with wide circles of contact in South America. He is a frequent contributor to BRAZIL magazine and is well informed on the largest of the South American republics.



Courtesy of *Memoria Médica*

One of the plants, showing berries and leaf, from which curare is made.

diameter, generally in May and June. The outer bark is smooth and the inner orange bark turns brown on exposure.

Strychnos guianensis, the second one, belongs to the intermediate group. It is called *urari-uva* on the Japurá River and *irariana* on the Rio Negro in Brazil. This species has lance-shaped leaves about 1.2 to 3.5 inches long and 0.5 to 1.7 inches broad. It bears cream-colored or greenish-white flowers and yellow-to-orange berries.

The third, *Strychnos toxifera,* found by Schomburgk in the Kanaku Mountains in the Guianas, has also been collected in the Orinoco basin, in the Juruá basin of Brazil, and in Panama. It is a woody climber of but 20 to 30 feet in length, having long rusty hairs on its branchlets. Its leaves are five-ply nerved, and it bears pale yellow or white flowers, usually in June, and bluish-green globose berries.

The flowering seasons of these and other species vary with the appearance of the rainy season, and the berries with the termination of that season. When these big bush-ropes reach the forest canopy, their branches have a tendency to take on a witch's broom effect.

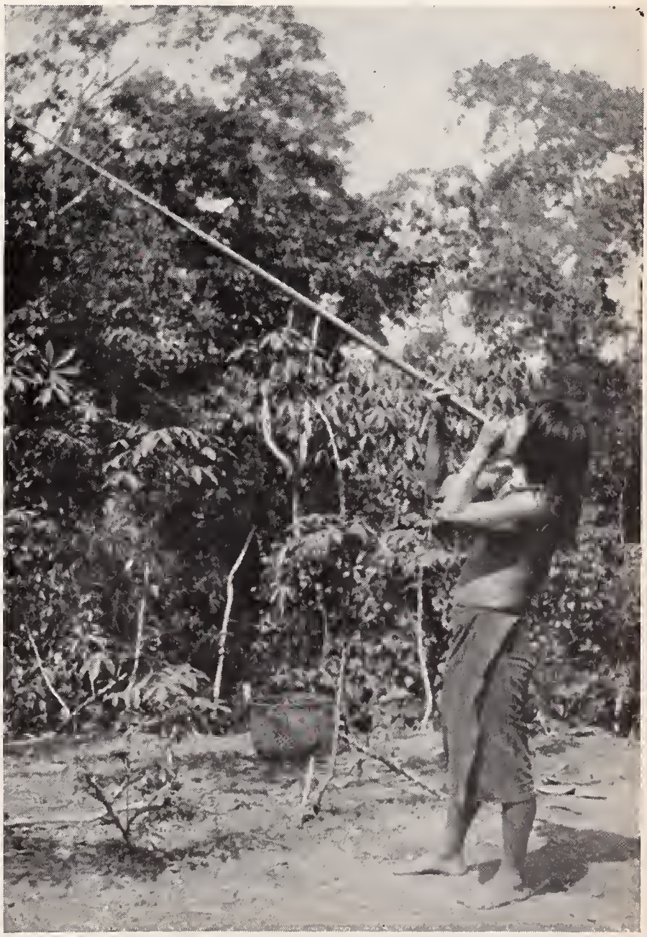
Curare for Dart Points

Briefly, the making of curare generally consists of boiling down a concoction of selected ingredients from bark, roots, stems, and tendrils of the different species of plants, skimming off impurities, filtering the residue, adding the chosen catalytic agents (such as *Annona ambotay, Capparis sola,* or others), and boiling to a syrup. The syrup is exposed to the sun in flat earthen vessels so that the curare will thicken into a paste. When ready, it is placed in clay gourds, or calabashes, that are tightly covered. It is often put into bamboo tubes to be exchanged for the goods of other tribes and hunters unable to make curare. If the curare loses strength, this can be restored by adding the juice of *Manihot utilissima* or *Annona ambotay* and burying it in a well covered calabash set in warm earth for a day or two.

The dart end on which the poison has been placed is sometimes covered with a thin layer of wax to preserve the curare against weakening moisture. If this is done, the wax layer is peeled off immediately before the dart is inserted in the blowgun. These darts are generally about 14 inches long and somewhat thicker than a match stick. To get the greatest stiffness with the least weight they are often made from the rib of a chonta palm leaf, or *Maximiliana regia,* which has iron-hard wood. If knives are not available, a groove is cut around the dart with jaguar or piranha teeth, about an inch from the pointed end. Liquid curare is then applied to the pointed end, being dried on by placing it near a fire. The weakened tip breaks off in a wound, and thus it cannot be pulled out quickly.

Monkeys often try to pull out darts as soon as they are hit. Imaginative stories have been told of scolding monkeys madly hurling back poisoned darts at the hunter who shoots them, while assuming the most indignant poses and offering symbolic gestures.

(Continued on page 193)



Courtesy of Bureau of American Ethnology

Jivaro Indian using a blowgun.

Growing Bananas on Acid Soil

Although a shortage of shipping facilities has been a major factor in keeping bananas from reaching United States markets in the past year or so, a more serious long-time threat has been the Panama Disease. This is the first public report of a series of experiments to control this disease.

by GEORGE D. SCARSETH

When two diseases of man, yellow fever and malaria, were brought under control, the vast resources of the humid lowlands of the American tropics became accessible and great economic developments followed. But a disease of a plant, the Panama Disease of bananas, has threatened to injure much of this rich region and to destroy one of the greatest tropical crops of the Western Hemisphere.

Experiments conducted over a period of years prior to 1935 to control the Panama Disease proved that the disease organism persists for some time in the soil as a fungus (*Fusarium bulbigenum cubense*). This disease causes the infested banana plant to wilt and die. Until 1935 all the experiments tried had been discouraging and no practical "cure" was found, although selection of healthy bits and attention to field sanitation measures retarded the spread to new areas.

About this time a series of experiments that resulted in a sequence of positive facts were started in La Ceiba, Honduras, by A. J. Chute, Manager of the Standard Fruit Company, in collaboration with the author, L. A. Richardson, and H. H. Sneed. From these experiments certain measures have evolved that contribute to the complex problem of recovering diseased areas and obtaining good production.

A district headquarters building. This picture was taken in 1942. By 1944 the building was taken down because the bananas were gone.

No Disease at First

The banana industry came into being at about the beginning of the century and the Central American countries became famous for banana production. At first bananas would grow in healthy lush abundance almost anywhere along the coast of the Caribbean countries. There was no disease and the virgin soils were fertile from the dense jungle. All that was necessary was to cut the jungle, plant, clean and prune a few times; and then harvest. New towns and villages were built around the centers of production. Many of these were model communities with wharves, railroads, machine shops, stores, golf courses, tennis courts, and hospitals.

Abandoned banana land growing up in worthless brush.

Suddenly, about 1910 a wilt started to kill certain banana plantations. It spread fast in some areas and in others it seemed to work slowly, but in most places it completely destroyed the plantations. The extent of the devastation

---

The author, a recognized soil scientist, was long associated with the Alabama Polytechnic Institute and Purdue University. Since 1926 he has specialized in banana production. He was soil chemist for the United Fruit Company until 1928 and since 1934 has been consulting soil chemist for the Standard Fruit Company. At present Dr. Scarseth is director of research for the American Farm Research Association of Lafayette, Indiana.

A disease abandoned spot in a new banana plantation. Abandonment often starts before the jungle trees have rotted away.

caused by this disease is evident from the traces of abandoned banana towns scattered along the Caribbean coast. Since the appearance of the Panama Disease, the banana plantations have been on the march and are now largely in the more distant interior valleys and on the more arid western coast.

For a number of years banana production was maintained because there was always more land to open, more jungle to cut, and a fair margin for profit even if it did cost a lot to abandon the old and open the new. As long as there was still new land to open, people were not much concerned with the question of disease.

Major Problem by 1920

By 1920 Panama Disease was a major problem. A number of scientists, mostly pathologists, were busy studying the habits of the soil-born fungus. Prominent names in this connection are E. W. Brandes, of the U. S. Department of Agriculture, and Otto Reinking, of the United Fruit Company. About 1922, B. T. Galloway, also of the U. S. Department of Agriculture, suggested that the acidity of the soils of diseased and undiseased areas be determined. This was at a time when soil scientists had learned to measure soil acidity in terms of pH values. Here was a new tool to be tried. Lewis Knudson, of Cornell University, found evidence that the disease destruction increased with the acidity of the soil. O. C. Magistad, N. J. Volk, H. S. Dean, and I were obtained by the United Fruit Company to work further on this clue. Extensive surveys proved that alkaline or neutral soils would give a longer life to the banana plantations than would strongly acid soils. This formed the basis for extensive land explorations to find the areas of such lands. There was still much land of this type to be developed, so the Panama Disease problem was avoided for a time.

Natural Disinfection Found

When acid lands were found to be short-lived and alkaline lands longer-lived, we thought a control would be only a matter of liming the acid soils. Such experiments had no effect on the Panama Disease. Something was missing.

The experiments of the Standard Fruit Company near La Ceiba, Honduras, with Gros Michel bananas on acid soils began between 1932 and 1935 with lime and fertilizers. Out of 31 such experiments where lime was added to or near the surface of the strongly acid soil immediately followed by planting, no positive results were obtained that could be ascribed to the lime or to the fertilizer, but in nine locations the disease infestation was considerably retarded. The only reason for this seemed to be that these nine experiments occurred on lands that had been free from old diseased matts for 8 or 9 years. Use of the land for sugarcane or pastures had been the means of cleaning out the diseased host plants. Where the disease-carrying host plants had been cleaned out more recently, now plants became diseased within 5 to 7 months. Apparently a partial natural disinfection of the soil occurred 8 or 9 years after the diseased host plants were removed. This was the first outstanding fact to be established thus far and the first encouraging one in the development of the control measures.*

Observation showed from these experiments, as well as from field observations, that the disease worked faster in the acid sandy soils than in the acid heavier clay loams or clay soils. This indicated that light-textured, acid soils must be avoided.

Typical rain-forest jungle that will make good banana land. The soils in such areas are usually acid and very susceptible to Panama Disease.

More experiments followed but further positive developments did not result until a new approach was used, based

(Continued on page 194)

---

* Greenhouse and laboratory experiments with tomato wilt (*Fusarium bulbigenum lycopersici*) in San Salvador, El Salvador, by F. L. Wellman of the U.S.D.A.'s Office of Foreign Agricultural Relations strongly support the biological disinfection implied in the experiments described in this article.

Wearing apparel and other articles for the home, made by 5-V Club members in Venezuela.

4-H Clubs in the Americas

Agricultural and homemaking clubs are doing valuable work among rural young people. This article tells briefly of the growth of the 4-H Club program in South America and the Caribbean area.

by **GERTRUDE L. WARREN**

Many agricultural leaders throughout the Americas are becoming increasingly interested in the work of the 4-H Club and its adaptation to their own countries. Several of the republics in which the work is comparatively new are sending representatives to countries where 4-H Clubs, or the equivalent in the country's nomenclature, are well established, in order to study the methods used. These representatives then return and carry on the work among the young people in their own countries.

In Venezuela, agricultural and homemaking clubs for rural young people are known as the 5-V Clubs. The first V stands for Venezuela, and the other four for *Valor, Vigor, Verdad,* and *Vergüenza,* which are the Spanish equivalents for the qualities of the 4-H's. For the past 4 months Mrs. Carmen Compos de Carmona, Director of Home Demonstration and Girls' Club Work in Venezuela, has been studying the work of the 4-H Clubs in the United States under the guidance of the Federal Extension Service. The work in Venezuela was started by Luis Mata Sifontes, of the Ministry of Agriculture, who went to Puerto Rico in 1939 to study the 4-H movement there. Today in Venezuela thousands of rural boys and girls are enrolled in 5-V Clubs. The 5-V girls have learned how to make their own clothes, how to earn money from home industries, how to grow vegetables and can them for home

---

The author is on the staff of the Extension Service of the U. S. Department of Agriculture and is in charge of the organization of 4-H Clubs in the United States.

consumption in order to improve diets for themselves and their families. Similarly the 5-V boys have learned how to raise vegetables, various farm crops, and some livestock.

Brazil has had several representatives studying 4-H methods in this country. Eduardo Hugo Frota is receiving special training in Colorado, where there is ample opportunity to see how 4-H Club work is conducted in rural communities. Dr. Edison Cavalcanti, Director of the Social Welfare Nutrition Service, and Dr. Clara Sambaquy, pediatrician and nutrition specialist, Rio de Janeiro, have recently spent 4 months in Mississippi and Georgia, studying foods, nutrition, child care, home demonstration methods, club work, and management of school lunches. They were accompanied for part of the time by June Leith Nordin, whose article "For Better Living in Brazil" in the August issue of AGRICULTURE IN THE AMERICAS tells the story of the new training in nutrition, home demonstration, and club work which Dr. Cavalcanti and Dr. Sambaquy are starting for young people in Brazil.

During the past year Miss Gladys Gomien of Chile has been studying in the Federal Extension office. With the help of the personnel assigned to the training of students from other countries, Miss Gomien wrote her thesis on the organization of 4-H Club work. She has now returned to Chile and plans to incorporate 4-H Club work in the rural welfare activities under her direction.

Jamaica has over 6,000 rural boys and girls enrolled as members of 4-H Clubs. Miss Inez Gray and Miss Ivy Lewis, assistant organizer and assistant secretary respectively of 4-H Club work, returned to Jamaica August 1 after 3 months of study of 4-H Club methods in the United States.

In Cuba, 4-H Clubs are known as 5-C Clubs. One C stands for Cuba. The other four C's have the same general meaning in Spanish as the four H's have in English—*Cerebro, Corazon, Cooperación,* and *Civismo.* Reports indicate that the work of the 5-C Clubs in Cuba is progressing in a most satisfactory way. A 5-C convention is held there each year. This convention does much to stimulate and maintain the interest of the 10,000 or more members, who work hard to produce products that will qualify for the 5-C exhibits.

Three happy prize winners.

A group of 5-V Club girls in Venezuela who are carrying on a gardening project.

Similar satisfactory reports of the progress of clubs for rural young people are received from other parts of the Americas. In Quebec, Canada, much interest is evidenced in 4-H forestry clubs. In Peru a new bulletin on 4-H Club work has been published recently by the Peruvian Government. In Haiti and other islands in the Caribbean the work is being carried on with enthusiasm.

In the United States during the past year the 4-H Clubs set a new high mark in the number of rural boys and girls enrolled and in the amount of food produced and conserved. In all, they raised enough food to feed a million men in the armed forces for a whole year. In addition, they collected thousands of tons of scrap for war purposes, bought or sold over 30 million dollars worth of war bonds, and volunteered in many ways to do their part toward winning the war.

This spirit of service seems to be high-lighting the 4-H Club program by whatever name it may be known throughout the length and breadth of the Americas. It is well expressed in the 4-H Club pledge:

I pledge—My Head to clearer thinking,
My Heart to greater loyalty,
My Hands to larger service,
My Health to better living, for
My Club, my Community, and my Country.

PROTECTION FROM INSECTS

(Continued from page 185)

Houses should be well screened or, if screening is not available, bed nets carefully arranged so that mosquitoes cannot get under them should be used. If mosquitoes have gained entrance to the house, they may be killed by spraying the interior of the house with a kerosene-extract of pyrethrum, or any other satisfactory insect-killing material. After they have had their meal of blood, mosquitoes often remain hidden in dark corners, behind pictures and under beds. These places should be sprayed with a hand atomizer or compressed-air sprayer having a nozzle which will give a fine droplet spray.

The yellow fever mosquito of tropical America is also the carrier of the debilitating disease known as dengue or break-bone fever. It is strictly a domesticated species and breeds in barrels, buckets, and vases. Control measures include the elimination or treatment of standing water and the systematic use of flysprays.

For controlling breeding areas along the shores of rivers or lakes, dusts or oils may be applied with a power gun from a boat.

In addition to the mosquitoes mentioned there are many species of the so-called pest mosquitoes which breed in such numbers as to make outdoor work practically impossible. Control measures are much the same as for the other species of mosquitoes and, when available, the previously mentioned repellents—dimethyl phthalate, Rutgers 612, Indalone, or a mixture of them—are effective.

The Blackfly

Blackflies or buffalo gnats (*Simulium*) are frequently a source of severe annoyance in the Tropics and their bite is poisonous to some individuals. These insects also transmit the nodular worm *Onchocerca volvulus,* which is a serious problem in certain of the coffee-growing areas. The blackfly breeds in rapidly flowing streams, and thoroughly satisfactory methods of control have yet to be developed. The larvae, which cling to rocks in the water, may be killed by the introduction of certain of the coal tar creosotes which have been treated so they will mix with water. The only drawback is the fact that this procedure may be destructive to fish. Repellents for blackflies include those already mentioned and certain of the bland pine tar oils used on animals for their protection. Smudges also have been found to give partial protection when animals have access to them.

Sand Flies or Punkies

Minute gnats, sometimes called sand flies or punkies, are particularly troublesome in the coastal areas of tropical America, where they breed in the salt marshes. Other species of these gnats breed in wet soft soil along the margins of streams and ponds and in rot holes of trees that are kept wet by sap and rainfall. Sand flies are so small they readily pass through ordinary untreated screens. A mixture of one part of pyrethrum extract to five parts of light lubricating oil painted on the screens will prevent their entrance during the night. Also repellents and smudges are good protectors.

The Fly

Flies are universal annoyances and carriers of disease. The common housefly stands in the front rank of this group as it breeds in excrement and decaying vegetable matter and is thoroughly laden with germs. These germs are transferred to food, and the result may be an outbreak of the devastating diseases typhoid fever or dysentery.

Fly sprays, sticky flypaper, and adequate screening aid in control. Fly traps fitted with large cones, properly baited and suitably located around houses and barns, will capture a great number of flies. Breeding places should be treated or eliminated, and manure should be removed promptly from stables and spread thinly on field lands. Accumulations of fermenting vegetable matter, such as grass clippings, should be scattered or buried promptly.

Some of the large blue and green blowflies carry disease germs to food, and others attack wounds or soiled wool. One, the screwworm, is parasitic and breeds only in the healthy tissues of man or animals. Attacks on man may occur on any part of the body, although the nose is most frequently infested. Those who are troubled with catarrh and nosebleed should not expose themselves by sleeping in the open during the day. The ointment Smear 62, developed by the U. S. Bureau of Entomology and Plant Quarantine, will do much to reduce attacks of this insect on animals.

Another parasitic fly which attacks both man and livestock is known as the *ver macaque, torcel,* or *ver moyocuil.* This fly is common in many parts of tropical America. The young penetrate the skin and develop pustular swellings, causing considerable anxiety and pain. The rather large fly which develops from these larvae has the peculiar habit of attaching its eggs to other insects. Such attachments are most often made to biting flies or mosquitoes, and the warmth of the animal stimulates the hatching of the eggs when the insect bearing them obtains a blood meal. This is the method by which the larvae usually reach the skin of man or animals. Destruction of the larvae in hogs, cattle, and other domestic animals should reduce the opportunities for human infestation, but there seems to be no certain way of entirely preventing attacks on man.

A large number of different kinds of blood-sucking flies, known as horseflies or deerflies, are to be found in the Western Hemisphere. These insects serve as carriers of such diseases as anthrax or tularemia (rabbit fever) and their bites are painful. They breed mainly in marshy or swampy areas and, while their numbers may be reduced through drainage, control is not easy. Chemicals seem to have little effect as repellents.

The battle against insects from which man must be protected is a never-ending one. It must, however, be carried on with increasing effectiveness if our armed forces, our agricultural workers, and our children are to be saved from the ravages caused by harmful infestation.

CURARE—POISON AND MEDICINE

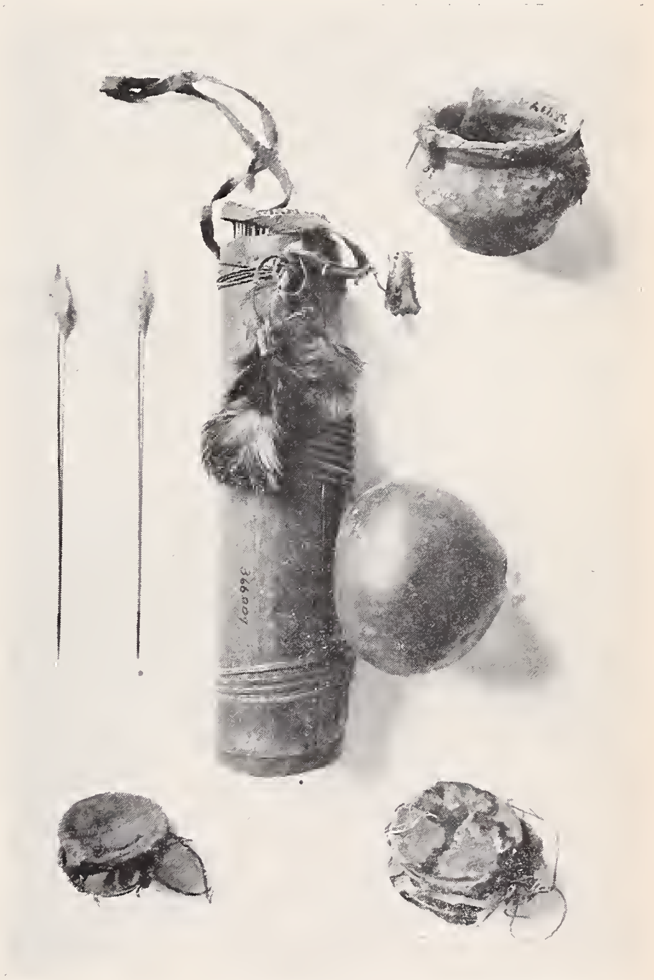
(Continued from page 187)

The Blowgun

The blowguns from which the poisoned darts are shot are made by different techniques and vary in length from less than 9 feet to 15 feet. One type of blowgun is made from the chonta palm *Guilielma speciosa.* After drying about a week, the trunk is split in half, and two strips about 3 inches wide and the desired length are cut out by means of a machete. These strips are rounded and shaved until when put together they form a cylinder tapering from about 1.25 inches in diameter at one end to three-quarters of an inch at the other end. A groove is ground out to form the bore of the gun, and the two strips are firmly glued together. The outside of the gun is smeared with a substance which can be dressed to a glossy surface, and a bone mouthpiece is fitted into the large end.

Another kind is made from *Iriartea setigera,* which is from 0.5 to 2 inches in diameter. The softer center is pushed out with a harder wood, making the bore of the gun, and it is scraped down to glass smoothness, both inside and out, with sandstone or river shells. This is done so perfectly that it fits snugly into a hollowed larger stem, which also has received an interior and exterior polishing. The two tubes are cemented together with any available vegetable glue, such as that made from the juice of *Sapium acuparium.* The trueness of the inner tube is thus preserved not only from warping but against collisions that might damage its accuracy if their shocks were not absorbed by the outside tube. After the cement is dried, the bell-shaped or conical mouthpiece is carved.

Every dart has some cotton or kapok wadding wound around its blunt end to make it fit snugly into the bore of the blowgun and to trap the air so that the dart will be explosively propelled from the gun by a puff of breath.



Courtesy of Bureau of American Ethnology

Blowgun equipment used by the Jivaro Indians. Left to right and clockwise around the picture: Two darts with floss or kapok (ceila floss) attached; quiver of bamboo with palm leaf filler; curare pot (made by the medicine man); gourd filled with floss; and two covers made of banana leaves and native cloth. Attached to the upper part of the quiver is the jawbone of the piranha which is used to partly sever the point of the dart just before it is blown from the gun.

In using the blowgun the hunter does not place his hands far apart, because the gun is not heavy, but holds them close to the mouthpiece so as to support the gun. Since the darts have a range only up to about 150 feet, skillful stalking of the prey is necessary.

(Continued on page 194)

CURARE—POISON AND MEDICINE

(Continued from page 193)

Curare in Medicine

Perhaps the reason why the Indians never learned that artificial respiration can revive a person receiving a curare wound is that they did not understand how the poison acts. Curare paralyzes the skeletal muscles, beginning with those of the eyelids, neck, fingers, and toes, and progressing to the arms and legs. In the forest this arresting effect continues, in a lethal wound, until paralysis of the respiratory muscles is reached. The drug does not affect the heart directly, but cardiac failure results from anoxia after paralysis of the respiratory muscles. In clinical usage the dose is so small and the action so transient that the desired effect is achieved without stopping respiration and vanishes in a few minutes. The application of artificial respiration to overcome a temporary paralysis of the respiratory muscles is as rarely necessary as it is simple in modern medicine. If this happens, recovery of the muscles, which is in the reverse order, causes the diaphragm and intercostal muscles to be the first ones restored to their full functions when proper treatment is given.

The Indians occasionally took small doses of crude curare orally for intestinal fevers and suffered only a headache as a result. As far back as 1844 Claude Bernard and T. J. Pelouze, in Paris, found that the alkaloid in curare has to penetrate the organism by other means than the alimentary canal to become effective. The poison may be sucked from a wound without danger, provided there is no ulceration of the mouth or alimentary tract. The Indians learned this, and they also tried ligature, incision, and application of salt to the point of entry, accompanied by frequent and copious draughts of salt and water, but usually without effect. Because of its starchy content, they used arrowroot to counteract the effects of the alkaloid poisoning. Even today there is no perfect clinical antidote for a large dose, although prostigmine, adrenalin, and intravenous injections of glucose can be effective against small dosages.

Today curarine, the alkaloid extracted from curare, is used in medicine to protect patients against fractures liable to occur in shock therapy for mental diseases, and in many cases it has made this shock treatment possible for persons who otherwise would have been unable to stand it. The drug is valuable, too, for certain diagnoses and surgical operations, but it is not an anaesthetic.

Curarine is so toxic that an exceedingly small amount is poisonous to a rabbit, and it is the most powerful sedative known. The name was given in 1824, in Bogotá, Colombia, by Boussingault and Roulin to the syrupy substance they extracted from crude curare. It was first isolated in crystalline form by Preyer in 1864, and in 1938 a Brazilian, Dr. P. E. Carneiro Barrêdo, gave us the chemical formula for a curarine extracted from *Strychnos solimoesana.*

From the crude use of curare for poisoning the darts by which the earliest Indians of South America secured their game *, to the highly specialized and carefully controlled use of curarine in modern medicine, is a long jump. The story of its usefulness today is an interesting one to students of the medical world.

GROWING BANANAS ON ACID SOIL

(Continued from page 189)

on the following established facts. The organism causing the Panama Disease is a fungus. In a broad sense fungi can thrive in acid soils; most bacteria do not. In the acid soils, therefore, the fungus had the environment largely to itself and had little or no competition from bacteria. Bacteria thrive best in neutral or slightly alkaline soils. Fungi, however, thrive in such soils, too, but neither would grow abundantly without the presence of food or energy. Organic matter provides the food energy necessary to microbial growth. Therefore, plowing under large quantities of organic matter on well-limed soils would feed the bacteria. The rotting of the organic matter would cut down on the free air (oxygen) supply, which is essential for the growth of fungi, but not essential to certain bacteria that can get oxygen from unfree sources (anerobic bacteria). Under such conditions the bacteria would greatly multiply and crowd out the fungi by competition. Thus by favoring the desirable organisms biological disinfection would be achieved.

New Experiments Started

Accordingly, in 1937 several experiments were started using this biological disinfection idea as a basis. The experiments were established on land which had been previously disease infested but which had been clear of living banana matts for the last 12 years. The soils were strongly acid, light clay in texture, and well drained. Heavy applications of lime, 12 to 15 tons per acre, were applied and worked into the top 5 to 8 inches of soil. Phosphate and potash fertilizers were also applied and the land was then planted to legumes such as crotelaria or velvet beans. Several of these crops were forked under in the course of 1 to 2 years before planting with bananas.

On June 15, 1939, a radiogram was received from Mr. Chute which stated in effect that the first experiment had gone 1 year without a single case of disease.

This was good news; but all of these experiments did not remain free from disease. Something was still missing.

---

* The poison does not make the meat inedible, nor is it transmitted by the flesh of game killed by it.

In one of the less successful experiments we discovered the legume crops had not been worked into the ground.

More experiments followed, some on as large a scale as 10 acres. These further verified the need for a relatively long period between the abandonment of the diseased plantation and the replanting; they also verified the need for turning into the ground large quantities of organic matter.

Depth of Lime Important

Within the last 2 years a new feature has been developed having to do with the depth to which the lime should be plowed under. An experiment is now in progress where, in addition to meeting all the other necessary conditions, lime has been added to a depth of 24 inches. On this plot not a single case of disease has shown up in 29 months. The check plot near it is 96 percent disease infested and was heavily diseased 5 months after planting. The lime material used was calcium hydrate, which has proved better than finely ground limestone, or calcium carbonate.

Bananas growing successfully on old Panama Diseased land after treatment.

In summarizing this new approach to growing Gros Michel bananas in acid soils on old Panama Disease abandoned land, the following are suggested: (1) Select a soil area that is clay in texture; (2) Start by killing the diseased host plants 10 to 12 years ahead of the other operations, although an effective soil disinfection reagent may shorten this to 1 year; (3) Apply hydrated lime to obtain a pH of 7.5 to a depth of 16 to 24 inches depending on the pH of the original soil; this might require 12 to 15 tons per acre; (4) Fertilize heavily with phosphate and potash and seed to legume cover crop; (5) Plow under several of these legume crops for a period of 1 or more years before replanting to bananas.

As a result of this work it is expected that production of this great tropical food crop can be brought back to certain abandoned areas and can continue on a permanent basis. The treatment of the soil for the control of the disease makes it so fertile that the yield and quality of the fruit are greatly increased.

Other advantages will result from stopping the "March of the Banana Plantations." This will mean that permanent communities can be developed. There may be no more boom banana towns, but neither will there be banana towns to die with the plantations. Permanent communities will bring better schools, better roads, and better living.

●

GOES TO NICARAGUA

(Continued from inside front cover)

Agricultural Experiment Station. Mr. Long will also conduct farm management and related studies on the production of strategic and complementary crops, with special emphasis on the distribution of rubbertree seedlings in eastern Nicaragua.

●

Assigned to Guatemala

***William C. Davis,* pathologist in the Office of Foreign Agricultural Relations, has been assigned to Guatemala, where he will assist with the program of the United States Government to stimulate the production of complementary noncompetitive agricultural crops. Mr. Davis will be in charge of an experiment station operated cooperatively by the U. S. Department of Agriculture and the Guatemalan Ministry of Agriculture.**

●

PARAGUAY CONDUCTS FIRST AGRICULTURAL CENSUS

(Continued from page 197)

production would be increased as a result of the credit.

The project is being carried out under the *Servicio Técnico Interamericano de Cooperación Agrícola,* an independent agency set up by the Ministry of Agriculture in cooperation with the United States.

▲ Brazil Encourages Mechanized Farm Equipment

That the Brazilian is keenly aware of the need for mechanization is shown by the fact that sales of farm machinery in Brazil totaled more than $50,000 last year. Through its various departments the Brazilian Ministry of Agriculture is doing everything possible to foster the use of modern machinery. One department imports from the United States tractors, plows, harrows, threshers, and other equipment which is sold, rented, or even loaned to farmers. Brazil has no customs duty on agricultural machinery.

Reading about the AMERICAS

The Old Aztec Story Teller, by J. A. Rickard, 59 pp., illus. Bernard Ackerman, New York; 1944. A collection of Mexican folk tales and stories based on Mexican history. They are told simply, as if by an old Aztec shepherd.

United States Trade With the Other American Republics 1942. 136 pp. U. S. Department of Commerce, Bureau of Foreign and Domestic Commerce, Washington, D. C.; 1944. United States trade with the other American Republics in 1940 and 1941, and, with the exception of strategic, critical, and military items, in 1942, is summarized and analyzed. The information given in Bulletin No. 25, of the International Reference Service for 1941, is brought up to date, as far as is possible under restrictions on publication.

Estación Central de Papa, Departamento Nacional de Agricultura, Exposición Nacional de Medellín, Bogotá, Colombia; 1944. (Translation) 4 pp., illus. Brief notes about the cultivation of the potato.

Estación Agrícola Experimental de Palmira. 56 pp., illus. Exposición Nacional de Medellín, Editorial El Gráfico, Bogotá, Colombia; 1944. An account of the history, personnel, and program of the station, and reports on the work of the various departments, with descriptions of a number of crop pests.

O fogo e os seus perigos, by Carlos Borges Schmidt. 16 pp., illus. Secretaria da Agricultura, Industria e Comércio do Estado de São Paulo. Diretoria de Publicidade Agrícola, São Paulo, Brasil; 1943. This pamphlet, in Portuguese, is concerned with the dangers connected with burning over the land, such as the decrease in the permeability of the soil, the hastening of erosion, the destroying of useful microorganisms, and the increasing of acidity in the soil. Precautions and legal requirements with respect to setting fires are explained.

Impressiones de los Estados Unidos, by Nicolás Repetto. 253 pp. "La Vanguardia", Buenos Aires; 1943. In the spring of 1943 a Socialist leader of Argentina spent 4 months in traveling in the United States from Miami to Los Angeles, with a detour through Montreal and Toronto. He visited many agricultural colleges and showed wide interest in science, education, art, history, and labor and social problems. This is his account, in Spanish, of what he saw and heard.

Estación Agrícola Experimental La Picota. 34 pp., illus. Ministerio de la Economía Nacional, Exposición Nacional de Medellín, Editorial El Gráfico, Bogotá, Colombia; 1944. An account of the work carried on by the station in improving the wheat, barley, rye, and oats grown in Colombia, with special emphasis on wheat.

Orientação geral para a cultura do arroz no Estado de São Paulo, by Hilario da Silva Miranda and Glauco Pinto Viégas. 31 pp., illus. Diretoria de Publicidade Agrícola; 1943. This Portuguese publication, put out by the Secretaria da Agricultura, Industria e Comércio do Estado, discusses and illustrates clearly different methods of cultivating rice.

Apuntes sobre sus principales actividades durante sus quince anos de existencia, by José B. Cosio. 50 pp. La Comisión Nacional de Propaganda y Defensa del Tabaco Habano, Imp. Muñiz, Habana; 1943. This is, as the title indicates, an explanation of the activities of the commission for publicizing Cuban tobacco and protecting the Cuban growers.

Plan de movilización agrícola de la Republica Mexicana. 23 pp. Secretaría de Agricultura y Fomento, Mexico, D. F.; 1943. A summary in Spanish of the results obtained in 1942 from the plan for the agricultural mobilization of Mexico to increase food production to meet war needs, and changes in the plan made for 1943 and following years.

El problema forestal en Chile, by Ricardo Hepp D. and Juan Jirkal H. 44 pp., tables. Litografia Concepción, S. A.; 1943. A series of lectures, in Spanish, given in the University of Concepción by the *Ingenieros Agrónomos,* on the problem of forestry and soil erosion in Chile, with a discussion of plants that may be used for forage.

O Norte e a industria de oleos vegetais sob o aspecto tecnico-economíco, by Joaquim Bertino de Moreas Carvalho, E. A. 301 pp., tables. Serviço de Informação Agrícola, Ministerio da Agricultura, Rio de Janeiro, Brasil; 1942. This book, in Portuguese, is the result of an official trip to northern Brazil, with attention to transportation and trade. The author gives tables of exports of fats, oils, and allied products from the various States, with suggestions as to future possibilities of expansion. He states that overproduction of vegetable oils is impossible because of the great demand for their use as fuel oils.

Banana Leaf Spot, Published by the Leaf Spot Control Division, Department of Agriculture, Hope, Jamaica; 1942. This 6-page pamphlet discusses the principal features of leaf spot disease, its effect, and the control of the disease by spraying.

Editor's Note.—The listing of publications here does not necessarily imply an endorsement of them by the Department. For copies of private publications, write direct to the publishing agency given in each case.

ALONG THE *Agricultural Front*

▲ Constitution Drafted For World Food and Agricultural Organization

A constitution and report for an international organization to increase the efficiency of agricultural production throughout the world and to raise the general standard of living for all nations has been drawn up by the representatives of 44 Governments who compose the United Nations Interim Commission of Food and Agriculture. This Commission was appointed in July 1943 to prepare a specific plan for a permanent international organization for food and agriculture as recommended by the Hot Springs Conference of June 1943.

The new organization, known as the Food and Agricultural Organization of the United Nations, will come into being when 20 nations have accepted the constitution. Those in charge of drafting the constitution hope that the various governments will find it possible to accept the constitution in time to enable the new organization (FAO) to hold its first meeting not later than January 1945, when the Interim Commission is scheduled to be dissolved.

Functions of FAO according to Article 1 of the constitution would be:

To collect, analyze, interpret, and disseminate information relating to nutrition, food, and agriculture.

To promote and, where appropriate, recommend national and international action with respect to: scientific, technological, social, and economic research relating to nutrition, food, and agriculture; the improvement of education and administration relating to nutrition, food, and agriculture, and the spread of public knowledge of nutritional and agricultural science and practice; the conservation of natural resources and the adoption of improved methods of agricultural production; the improvement of processing, marketing, and distribution of food and agricultural products; the adoption of policies for the provision of adequate agricultural credit, national and international; and the adoption of international policies with respect to agricultural commodity arrangements.

FAO shall also furnish such technical assistance as various governments may request; organize, in cooperation with those governments concerned, such missions as may be needed to assist them to fulfill the obligations arising from their acceptance of the recommendations of the United Nations Conference on Food and Agriculture; and generally take all necessary and appropriate action to implement the purposes of the Organization as set forth in the Preamble.

FAO will also include forestry, forest products, and fisheries in its scope. It will be concerned, not only with food but with non-food agricultural products such as fibers and oils. Nutrition as well as the production, processing, and marketing of foods will lie within its field of activity. A close-working relationship with other international bodies in related fields, such as may be established to deal with international credit, commodity arrangements, or public health problems, will be maintained. FAO will also become part of any general world organization set up to maintain world peace and to provide for international cooperation in the various fields.

The governing body of FAO will be a general conference which will meet at least once a year. Each member nation will have one voting representative.

▲ Chile Takes New Interest In Production of Olives

Chile is taking a renewed interest in the production of olives, olive oil, and pickled olives. A plan covering the various aspects of this important industry and calling for increased production was recently prepared with the assistance of the different departments of the Chilean Ministry of Agriculture. Supporters of the plan hope that necessary funds will be provided and that a program for the next 6 years may be developed.

▲ Cuban Government Forms Banana Association

For the protection of the banana grower the Cuban Government recently ordered the establishment of an organization to be known as the Association of Banana Growers of Barcoa and Banes. Membership is compulsory for all those engaged in planting or growing bananas in those areas. Among the problems which will confront the new Association as soon as it is organized will be maintenance of banana prices at or near the present level, control of exportation of immature fruit, and methods for fighting sigatoka disease, which is seriously threatening the industry in Cuba.

▲ Paraguay Conducts First Agricultural Census

Paraguay is realizing a long-standing ambition that is destined to play an important role in its post-war development. The country is engaged in the first agricultural census of its history. More than 90,000 farm families will be interviewed before the census is completed this fall.

Paraguayan officials say that the importance of this undertaking cannot be overestimated. It is expected to serve as an indispensable factor in Paraguay's economic development.

Paraguay has never had any accurate statistics upon which to base the long-range planning of its agricultural economy. While various programs have been launched to improve agricultural methods, increase acreage of cultivated land, and effect a wider distribution of land ownership, they have been handicapped in the attainment of their ends by the inadequacy of farm statistics.

Some idea of the significance of the census project may be gained from the type of information that is being gathered. The questions seek data on population and number of workers on farms, tenure status, type of ownership and status of land titles, size of farms by general land use, cultivation of gardens, improvements on farms, number and kinds of farm implements, gross farm income, rent (if any), credit and debts, area in each crop during the last 2 years and the anticipated production this year, quantity and value of sales of animal and other farm products, the amount of estimated credit needed, how credit would be used, and how

(Continued on page 195)

Gifts of the Americas

THE SAPODILLA

by **FRED A. MOTZ**

The sapodilla, a member of the family *Sapotaceae,* is in every sense a true Pan American. The tree is native to the tropical parts of America: Southern Mexico, Guatemala, and possibly Salvador and northern Honduras. In its homeland it is most appreciated for its fruit; in the United States and in many other lands it is best known for the milky latex contained in its bark, called chicle. Chicle is the basis for chewing gum. (*See* AGRICULTURE IN THE AMERICAS, June 1943.)

The tree is evergreen and stately; the wood is hard and durable. The fruit has been described in various ways and, although it has not struck the popular fancy as the pineapple, avocado, or cherimoya have done, it must be acknowledged as one of the best of tropical fruits. An English horticulturist once characterized it as a "cool, luscious and most agreeable of fruit," and a French botanist waxed quite poetic when he described it as having "the sweet perfumes of honey, jasmine, and lily-of-the-valley."

From its native home the sapodilla, like many of its associates, has been somewhat of a globe trotter. It is grown on the western coast of India and in Bengal, in Ceylon and parts of Africa. It is quite common in the Hawaiian Islands and is abundantly distributed from southern Brazil to Florida.

The common name, sapodilla, is taken from the Spanish *zapotillo,* meaning small zapote. In Mexico it is usually called *chicozapote,* but is also known as *níspero,* a name which properly belongs to the European medlar tree. In Yucatán, where the wild trees are tapped for chicle, the Mayan name *yá* is common.

The sapodilla is used almost entirely as a dessert fruit. It is seldom cooked or preserved in any way, except that in certain countries it is made into a sherbet.

Chico sapote is perhaps the most abundant and best known of the sapodillas. The fruit is about the size of a Japanese persimmon and nearly round. The skin is thin and when fully mature becomes delicate and rusty brown in color. The flesh is yellowish brown, sweet, and melting. The fruit contains several hard black flat seeds. It is frequently eaten with a spoon, or is put through a colander and, with orange juice added, is served with a topping of whipped cream.

In the United States the sapodilla is grown in both Florida and California, but in the latter State it has failed to adapt itself to the climatic conditions and, therefore, has never been successful commercially. In Florida its range on the east coast is limited from Key West north to Palm Beach, and on the west coast it will not succeed north of the Manatee River.

The fruit can be shipped successfully by following the usual care exercised in the harvesting and handling of perishables. The skin is thin and tender, and when fully ripe the fruit is easily injured. If picked when mature but in the hard-ripe stage, it can be transported over fairly long distances, since it does not begin to turn soft for several days. Shipments from the Florida Keys to New York have been quite satisfactory.

As with various other tropical fruits, the distribution of the sapodilla is limited because of its susceptibility to the attacks of certain injurious pests. It is one of the favorite hosts of the Mediterranean and Mexican fruitflies, a susceptibility which in some regions not only renders it unfit for human consumption but precludes the possibility of exporting the fruit to those countries where the pests do not exist.

Until some of these problems can be solved, many people will have to continue to think of the sapodilla in terms of chicle alone, expressed in the form of pepsin, spearmint, or wintergreen flavored chewing gum. In this form the sapodilla will have stretched itself many times around the globe.

AGRICULTURE IN THE AMERICAS O. R. CARRINGTON, EDITOR

A monthly publication of the Office of Foreign Agricultural Relations of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 10 cents per copy, or by subscription at rate of 75 cents per year, domestic; $1.20 per year, foreign. Postage stamps will not be accepted in payment.

THE AMAZON RIVER BASIN

by

R. G. Hainsworth

The most western tributary of the Amazon River begins with many small lakes in Peru, 18,500 feet above sea level and only 75 miles from the Pacific Ocean. A small stream from these lakes rushes down the Andes Mountains for 15 miles and enters the Lauricocha Lagoon, the principal headwater source of the Marañón, which flows through gorges, over rapids, and on to enter the Amazon. From that point the "King of Waters" flows nearly 3,000 miles to the Atlantic. In the last 2,000 miles the river, meandering through the greatest tropical forest on earth, descends only 35 feet, an average of 0.2 inches per mile. At least 15 of the tributaries are over 1,000 miles long, the Madeira River, nearly 3,000 miles in length, being the longest.

The Amazon is unexcelled for sheer size. It receives water from parts of Venezuela, Colombia, Ecuador, Peru, Bolivia, and a large part of Brazil, comprising about two-fifths of the drainage water of South America. In the lower main stream the Amazon River reaches depths of from 60 to 300 feet and in some places is so wide that a traveler does not realize he is on a river. During flood stages it forms a temporary inland sea in the forested lowlands. The river carries a load of silt and debris that has been estimated to exceed 160 million tons annually. Fresh water is pushed out to sea for 100 miles; yet the rise and fall of the tide is felt 500 miles upstream.

Climate

Climate is a vital factor in economic progress throughout the world. Although heat and high humidity prevail with remarkable uniformity over the entire Amazon basin, the climate is not so oppressive as that of many other areas of the world from which far greater resources are obtained. The mean annual temperature is 79° F., the average annual maximum 88° F., and the minimum 70° F. At night the average annual temperature is 78° F. in Belém, at the eastern end of the Amazon River, and 72° F. in Iquitos, about 2,300 miles upstream. Frequent winds partly alleviate the heat; though sometimes strong, they are not violent or destructive. In some places protected from the wind, however, the humidity is high enough to be very uncomfortable. Rainfall averages 79 inches a year, ranging from 57 inches in Mato Grosso to 112 inches in Pará. The majority of the rain comes during the January to June period, when the moisture-laden equatorial air masses move in from the North Atlantic. The drier period from July to December is merely one of less rain.

Population

The population of the Amazon basin is insignificant in numbers compared with that of eastern and southeastern Brazil. The States of Brazil wholly or partly within the basin in 1940 had populations varying from 81,000 to 950,000, with the number of people per square mile ranging from 0.6 to 2.9. In addition to Brazilians, people of five other republics also live within the basin.

Soils and Vegetation

Amazon Valley soils are sandy in some areas, in others moderately heavy in texture on the surface and quite heavy in the subsoil. The light-colored soils developed under leaching process have not been able, without the application of manures in some form, to produce good crop yields for more than a year or two after being brought under cultivation. Small areas along the lower river have soils made up largely of alluvial origin. Chernozems and reddish chestnut soils are found in that part of Bolivia drained by the Rio Grande—Mamoré branch of the Madeira River. There is also a wide variety in the soils of the mountains and mountain valleys. The Amazon has a greater variety of plant and animal life than any other known region on earth. Moisture and tropic heat over a large part of the basin favor a growth of plant life so luxuriant and vigorous that men have been unable to cope with it. Paths cut through the jungle are completely overgrown within a few weeks.

Transportation

The Amazon is one of the finest inland water systems in the world, providing its vast territory with an easy means of transportation. Ocean steamers up to 6,000 tons go up the Amazon to Iquitos, 2,300 miles from the Atlantic. River steamers, towing barges, ply between Iquitos and Pucallpa, a distance of 650 miles. There are no hard-surface highways in the Amazon basin, but there are 2 or 3 short railroad lines. Air transportation is increasing. Many airports, important landing fields, and hydroplane anchorages have been built, and the plane has become an important carrier of passengers and freight.

Resources

Products, such as rubber, nuts, oils, waxes, perfumes, yerba maté, and drugs, as well as timber come from untamed land of the Amazon basin. The few products that are cultivated are produced primarily for home consumption, as for instance corn, manioc, rice, and some vegetables which the rubber and nut gatherers grow to provide food for their families.

The world's chief source of rubber was the Amazon basin, the botanical homeland of the hevea tree, before rubber plantations were developed in the Far East. Rubber of the Amazon basin is so important to the United Nations that the inter-American rubber development programs call for 70,000

(Continued on back cover)

THE AMAZON RIVER BASIN

(Continued from inside cover)

tons in 1944 to help overcome the loss of the Far Eastern rubber supplies.

The Brazil nut is second only to rubber as an export commodity. Its primary use is as a food but its oil can be used for lubrication, lighting, and medicinal purposes. The Brazil-nut, babassú, and coconut trees are queens among the oil-producing plants of the Amazon. The fruit and seeds of numerous other trees and plants contain edible fats and oils of high food value, such as cattle cake, cooking oils, olive oil, lard, and cottonseed oil, as well as oils for making soaps and substitutes for cocoa butter. Other products are wax, resins, perfumes, and those used for medicinal purposes.

Sugar, oranges, bananas, melons, papayas, mangoes, and many other tropical friuts are produced in the valley areas. Several varieties of tobacco are raised in small plantings for domestic consumption. Terraced fields of coca plants, used to prepare drugs of the cocaine group, are on the eastern slopes of the Yungas. One of the most important of all cultivated crops in the Amazon basin is cacao, from which cocoa and chocolate are made. The higher temperature and humidity of the valley are ideal to its cultivation.

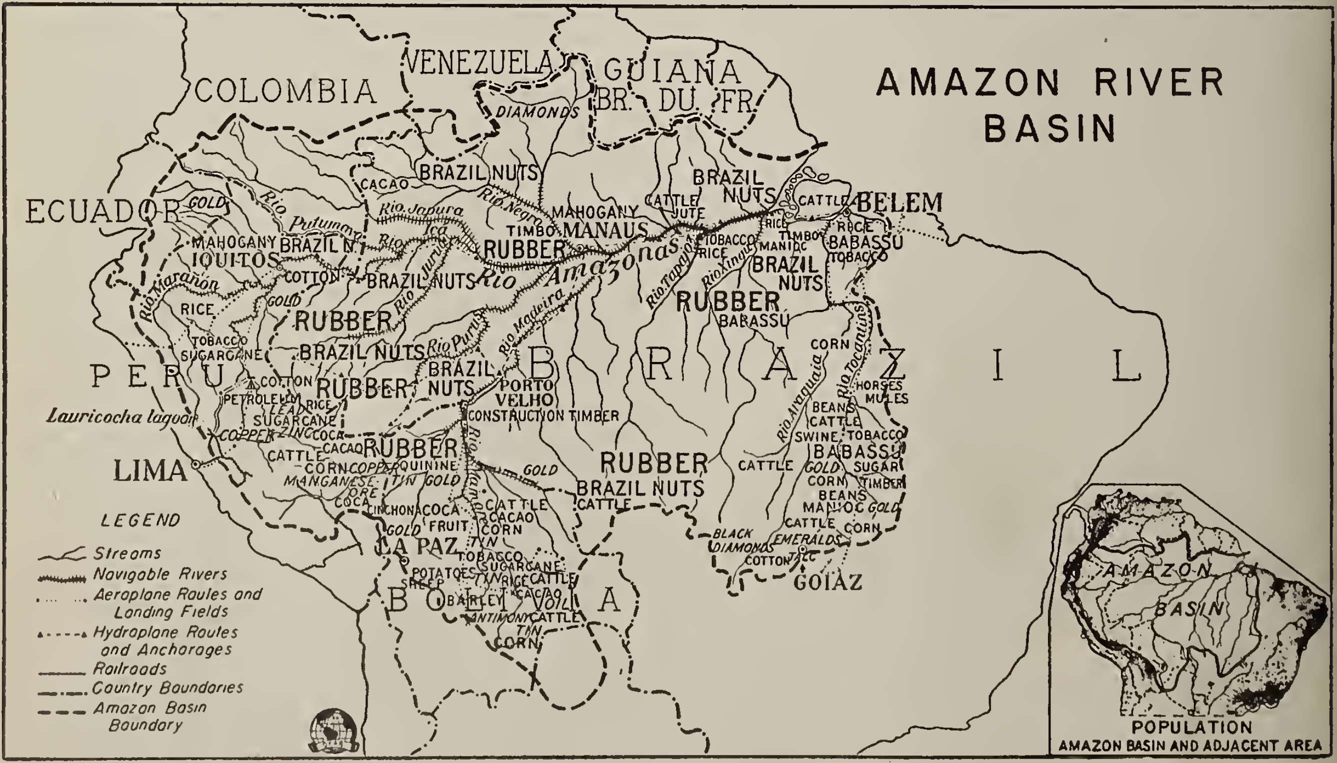
Rotenone is extracted from the plant timbo, which grows widely and abundantly. Jute has recently been successfully grown: about 22,000 pounds were produced in 1937; 771,600 pounds in 1940; and 11,000,000 pounds in 1943. Cotton is successfully grown around Iquitos, in the extreme southeastern part of the basin, and near the mouth of the river. There are grazing lands covering hundreds of thousands of square miles in the central plateau and many cattle are produced on the island of Marajó. The wood of many of the trees in the Amazon basin is highly colored and is of recognized value for lumber and cabinet woods.

The natural mineral resources of the Amazon basin are distributed in mountainous outcrops forming a thin ring around the outer edge of the basin. Gold, as washings in the streams, is generally distributed, particularly in Ecuador, Peru, Bolivia, and Brazil. White and black diamonds and emeralds are found at several places.

The only dependable supply of petroleum in the Amazon Valley is located about 50 miles from Pucallpa on the Pachitea River.

Conclusions

As much as 70 percent of the inner Amazon basin, an area of over a million square miles, is capable of agricultural development. The future development of the Amazon basin would seem to depend upon the growth of Brazil's internal industries, along with increased immigration, sanitation, education, transportation, communications. Manufacturers of textiles, rubber, lumber, and fiber products for domestic and export trade are beginning to tap the Amazon's raw-material supply.



☆U. S. Government Printing Office : 1944—607193

'32A

Agriculture IN THE Americas

Issued Monthly by the OFFICE OF FOREIGN AGRICULTURAL RELATIONS

UNITED STATES DEPARTMENT OF AGRICULTURE

LIBRARY
CURRENT SERIAL RECORD
NOV 25 1944
U. S. DEPARTMENT OF AGRICULTURE

IN THIS ISSUE

PAGE
An Entomologist Looks at Costa Rica 203
Mexico Reports 209
A Brazilian Evaluates a Neighbor 214
Along the Agricultural Front 216
Gifts of the Americas—The Turkey 219
The Guayas Basin—Ecuador 220

November 1944

3

NAMES & NEWS

To Study American Indians

Dr. Manuel Gamio of Mexico, Director of the Inter-American Indian Institute, is in this country conferring on Indian affairs with officials and specialists in that field. He is especially interested in obtaining data for a statistical census of Indians throughout the Americas, which is being compiled by the Institute. Recently he visited Panama, Colombia, Venezuela, and Brazil. He especially praises the work of Brazil with relation to Indian affairs.

In addition to research and investigation, the Inter-American Indian Institute is concerned with the problem of improving living conditions among the Indians. In Mexico a study of a typical Indian village in all its aspects has been completed, efforts are being made to raise the nutritional standard of the Indian diet, and special emphasis is being placed on hookworm in a public health campaign. In an effort to improve the diet of the Indians attention is being given to the use of soybeans. These are being used in the form of soybean milk and curd, and even more widely as an ingredient of the tortilla, principal item of the Indian's diet.

Studies Experiment Stations

Señor Raul Martínez, agricultural engineer and Director of the Agricultural Experiment Station at Palmira, Colombia, recently completed a tour of a number of Midwestern and Southern States, where he observed the cultivation of sugarcane, rice, cotton, and corn, and studied the organization and administration of agricultural experiment stations. He will make a report of his observations together with recommendations for the improvement and enlargement of the Palmira station.

Dr. Cowgill Assigned to Guatemala

Dr. William H. Cowgill, of the Office of Foreign Agricultural Relations, has been assigned to Guatemala to carry on research work with the cinchona tree. He will work on propagation and other problems.

During the last few years Dr. Cowgill has been working at the Foreign Plant Introduction Garden at Glenn Dale, Maryland. This work has been intimately related to the problems of propagating the cinchona plant on a large scale.

The Government of Guatemala is intensely interested in the production of cinchona, and an active group, known as the Cooperating Cinchona Growers Association, has been in existence for several years.

Visitor From Panama

Señor Alfonso Tejeira, Second Secretary of the Ministry of Agriculture and Commerce of Panama, and a specialist in the chemical analysis of soils, is touring certain agricultural and dairy regions of this country. A graduate of Cornell University, Señor Tejeira is especially interested in rice cultivation and the production of forage. In his itinerary he plans to include Wisconsin and the rice-growing section of Louisiana.

Señor Tejeira praised the cooperative program for the interchange of students from the Americas. He stated that approximately 100 Panamanian students will enroll in colleges and universities of the United States this fall. During his tour he expects to visit 10 Panamanian students who are enrolled in agricultural courses in Iowa.

Studies Pellagra Control

Dr. Marcelo Martínez Repetto, Mexican hematologist of Mérida, capital of the State of Yucatán, recently spent 3 months in the United States studying methods of combatting pellagra.

He stated that anemia is a serious disease in Yucatán. This is chiefly due to the prevalence of pellagra, and to the high incidence of diseases caused by intestinal parasites.

Visitor From Venezuela

Dr. R. Pinto Salvatierra, director of the Venezuelan Institute of Agriculture and dean of the Faculty of Agronomy in the University of Venezuela, is making a tour of the various agricultural regions of the United States. While in this country he will consult agronomists and other technical experts on construction plans for the Institute of Agriculture which soon will be enlarged and moved from Caracas to Maracay.

Dr. Salvatierra's itinerary will include the potato-growing sections of Maine, the rice and cotton regions of the South, and the citrus orchards of California. On his return trip to Venezuela he will visit various agricultural projects in Central America and Puerto Rico.

Agriculture IN THE Americas

Vol. IV. · NOVEMBER 1944 · No. 11

An Entomologist Looks at Costa Rica

This is a study of insect life in Costa Rica. The writer emphasizes the universal need for careful consideration of the insect problems in the agricultural life of individual countries.

by PAUL KNIGHT

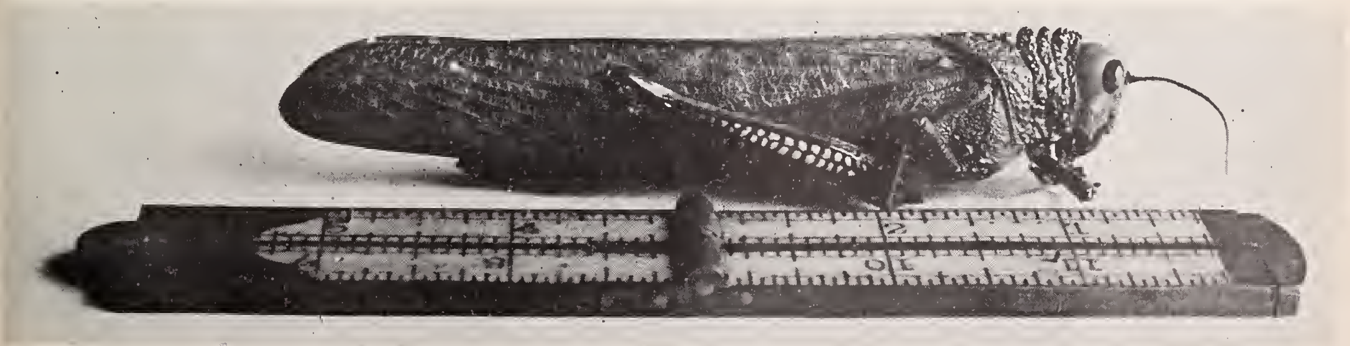
Few areas of similar size within the Western Hemisphere possess a greater variety of biological and climatic conditions than are found in the Republic of Costa Rica. Many areas ten or twenty times the size of this small country possess a less varied flora and fauna. Situated near the narrowing part of the isthmus connecting two great continents, this country comprises a kind of transitional belt or zone between North and South America.

While the area of Costa Rica is about the same as that of the State of West Virginia, the climate extends from the equatorial to the type characteristic of the lower part of the Temperate Zone as one travels from the hot Atlantic lowlands westward to the cloud-drenched forests high on the volcanic mountains of the interior. Agriculture varies accordingly, ranging from the banana, rubber, and cacao plantations of the coastal jungle, through the coffee *fincas* and truck gardens of the central plateau, to the dairy and potato farms high on the slopes of the surrounding volcanoes. Except for extensive banana plantings, beef cattle range, and an expanding development of hevea rubber and abacá, all in the lowlands, most of the agriculture of Costa Rica is carried on in the temperate central plateau, or *Meseta Central,* and in the much cooler lands higher up in the adjacent mountains where dairy cattle and potatoes thrive. The temperate middle altitudes, known in Middle America as the *tierra templada,* range roughly from 2,400 to 4,500 feet in elevation. The cold land, or *tierra fria,* ranges from about 4,500 to 12,000 feet, though there is little agriculture above the 9,000-foot level. The core of civilization and agricultural development is found in the *tierra templada* and in the lower reaches of the *tierra fria.*

Complex Geography and Biology

The geography and biology of Costa Rica are complex and diverse and, while the landscape itself is gentle and well modulated as compared to countries like Peru or Mexico, a riot of plant and animal life exists that will challenge the ingenuity of scientists for generations to come. It is an especially rich field for the study of insect life. Small as this country is, little of it has been explored entomologically.

Until recently much of the country was somewhat inaccessible because the central plateau and adjacent territory are separated from much of the remainder by mountains of extremely rugged character. New highways and a rapidly developing local air transport system will only partially



Insects are plentiful in the Tropics but oversize ones, such as this locust, are small in number.

Small tracts of land are the rule in the central plateau of Costa Rica. This picture was made at an elevation of 8,000 feet in the Volcano Irazú area.

break down this isolation. These factors, together with the great productivity of the soil of the cool uplands, have kept the major portion of the population within a comparatively few miles of the capital city of San José and the nearby cities of Cartage, Heredia, and Alajuela.

There are many misconceptions about the insect life of tropical countries like Costa Rica. Much of this is due to the fact that writers often seek to emphasize the differences between the life of warm and cool climates without much regard for the many points of similarity. North Americans often hear about the mosquitoes and insect-borne diseases but are seldom told that in many locations in the Tropics window and door screens are less necessary than in some places in the United States. Audiences are lectured on the brilliantly colored butterflies and moths, when as a matter of fact the percentage of these conspicuous insects in the Tropics is about the same as in the Temperate Zone. All insects in the Tropics are not gigantic, and the percentage that is destructive to plant life or dangerous to human health is, as elsewhere in the world, relatively small.

Individual Situations Different

Crop pests in Costa Rica are not as destructive as an entomologist from a cooler climate might expect. This is due in part to the fact that, except for the large coffee *fincas* and dairy farms, most of the land holdings in the *Meseta Central* are small and highly diverse in their system of planting. In the principal area of food production, vast uninterrupted tracts planted under the one-crop system so favorable to the multiplication and dispersal of insect pests do not exist. The potato and grain fields and the vegetable gardens of Costa Rica are small checkerboard plots in valleys and on mountainsides. Between areas of cultivation one also observes many fields standing idle for a year, an agricultural practice long in use especially on the volcanic soils where organic matter is at a premium. This diversity of culture undoubtedly prevents or arrests the development of large populations of some pests that under a more extensive system of agriculture might become important factors in crop production.

Certain crops, however, do take enormous losses from insects, sometimes amounting to almost total destruction, and there are also several other problems of great medical and veterinary importance. How much of a pest toll the Costa Rican farmer pays is a matter of guesswork, for statistics are lacking, but the losses suffered in some of the more important crops are sufficient to warrant a more complete study of their major pests. The Costa Rican farmer is much the same as the North American farmer in that he looks upon insect control largely as a means of increasing the volume of production rather than of improving the quality of his crop. During the rainy season, extending from May through November, fungus diseases are equally as destructive as insects, following in the wake of injury by insect feeding. As an example, cabbage, which is an important item of produce, is attacked by two leaf-feeding species common in the United States—the southern cabbage worm (*Pieris protodice*) and the diamondback moth (*Plutella maculipennis*). It is noticeable in the city markets that the cabbage with the greatest amount of rot is most severely riddled by the feeding of these two species.

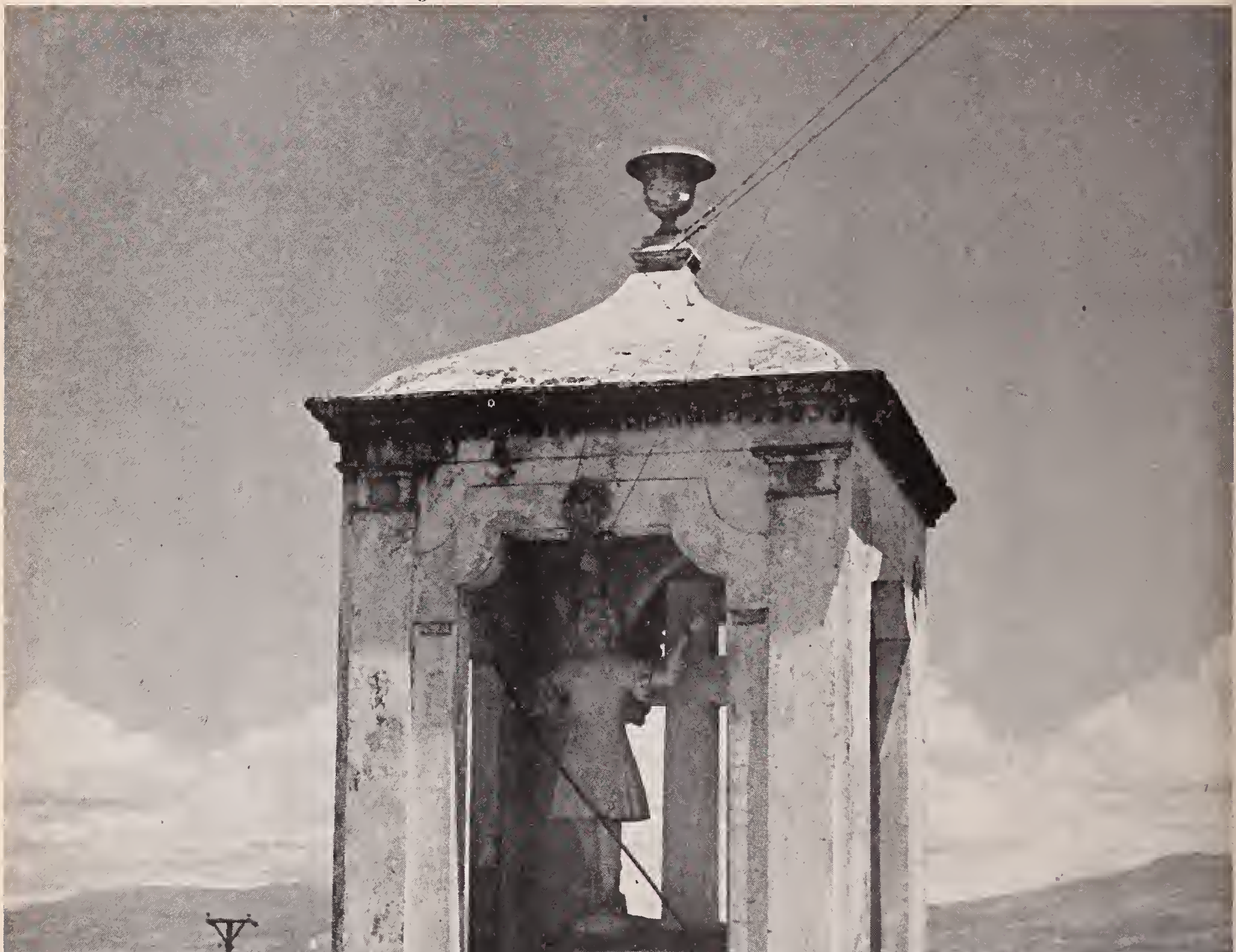
Because of the high relative humidity existing during most of the year, plant diseases assume an importance not easily comprehended by scientists accustomed to cooler and drier climates. Although most of these fungus and bacterial diseases do not depend upon insects for their transmission, they would have far less opportunity to damage leafy plants if avenues of infection were not made so easy. Most fruits and vegetables move to the markets of the cities without benefit of refrigeration. Some of them come in trucks but a large number are brought in the highly decorated oxcarts peculiar to the country. This produce often reaches the markets in a partially decayed state and has to be sold at a discount. From the standpoint of shipping losses the importance of quality, therefore, assumes even greater importance than in the United States.

The entomologist from North America finds agricultural methods far different from those to which he has been accustomed. Some of the common farm practices at first seem somewhat out-of-date, but often when so-called "modern" methods are introduced they fail. It is not always easy or even possible to account for these failures because they seem to be improvements on the system in general use by local farmers. But after one has studied the pattern of land utilization and management of the highlands of Costa Rica he comes to understand that the Spanish farmer has developed over a long period of time a system that is far more adaptable to the soil and climate than can be appreciated by superficial observation.

It should be obvious to any technician that, while improvements such as seed selection, soil analysis, and pest control can be made, these should follow the general framework of the agriculture of the country. As an example, in the potato fields high on the Volcan Irazú there is a relatively high percentage of injury from common white grubworms (*Phyllophaga* spp.), the larvae of common June beetles which attack many root crops. This pest seems to be favored by the fact that once every 3 or 4 years these fields are allowed to grow up in grass and weeds in order to provide much-needed organic matter, during which time these pests have greater opportunity to develop. While a continuous rotation and the abandonment of the practice of fallowing land frequently should reduce the grubworm population, it would unquestionably rob the soil of organic matter, and in this instance the element of fertility seems more important than pest control. Perhaps the Costa Rican farmer will adopt the system of planting perennial legumes as crops to serve as a possible means of controlling grubs and improving organic matter as well.

Many cosmopolitan insects in Costa Rica—species such as the sugarcane borer (*Diatraea saccharalis*), the rice weevil (*Sitophilus oryzae*), and the housefly (*Musca domestica*)—have followed their favorite food around the globe. Certain others, like the banana-root borer (*Cosmopolites sordidus*) and the purple scale (*Lepidosaphes beckii*), are found rather generally in the tropical world. Some pests of citrus and other subtropical crops occur also in the United States—in Florida, Texas, and California. But many

"Spot" dusting for newly hatched migratory locusts in the Pacific lowlands.



A monument which was erected by the town of Escazú to show its appreciation for freedom from locust plague. A translation of the inscription reads: Homage to Saint Michael for having liberated us from the locust June 1915.

insects are totally unfamiliar to a newcomer and are not easily identified. Sometimes the thread of family relationship that runs inextricably throughout the entire insect world aids in identification. Often a pest is encountered which belongs to a familiar family or genus, one that perhaps occurs widely over the earth. This relationship is so strong that in many cases most or all of the members of the family or genus have similar habits, and so the entomologist is not always on unfamiliar ground. In Costa Rica, for instance, it is easy to recognize the notorious members of the genus *Diabrotica.* In the United States it is known through three highly destructive species of cucumber beetles. In Costa Rica there are at least eleven and possibly more species of this genus, all of them similar in habit to those of North America.

There is no assurance that a species common to Central and North America will have the same habits in both locations. The corn earworm or bollworm (*Heliothis obsoleta*) is a severe pest of tomatoes in Costa Rica as it is in the southern part of the United States, but it is not a serious factor in corn production. This species ranks as one of three or four of the most destructive crop pests in North America. The Mexican bean beetle (*Epilachna varivestis*) is present in Costa Rica and beans are generally available; yet this species is insignificant as a garden pest. The migratory locust (*Schistocerca paranensis*), periodically destructive in the Pacific coastal regions, is considered in most parts of Latin America as a pest which is favored only by dry seasons and semi-arid conditions. In Costa Rica, however, this species becomes seriously epidemic during the season of heaviest rains and actually lays its eggs and hatches in waterlogged soils. These are only a few of the numerous biological inconsistencies a North American entomologist meets when he travels so far from home base, but they illustrate the necessity for a thorough study of all the pests of the Western Hemisphere in each locality where they are important elements in agricultural production.

Difficulties In Insect Control

The control of insects in Costa Rica presents difficulties not always appreciated by entomologists working in North America. To say that the Costa Rican farmer is not aware of the presence of pests or conscious of the damage they do is not an accurate observation. The author found the average farmer very observing of the condition of his crops, often possessing a surprising fund of information as to the season of occurrence, host plants, and other data. This was particularly noticeable in the case of the migratory locust in the lowlands of the Pacific, where farmers had watched the sporadic outbursts and decline of this pest for many years.

Why he may do nothing about crop insects is quite another story. In the first place, recommendations have often been made by entomologists from areas totally dissimilar, frequently running counter to the prevailing agricultural pattern. The farmer is unable to adopt such suggestions without changing completely the management of his farm. The hazards entailed in this are too obvious to require elaboration.

Another factor is the element of cost. What seems like economical insect control to a producer of truck crops in New Jersey may prove prohibitive in Costa Rica, where plantings are diverse and there is seldom a large acreage given over to a single crop. While the average Costa Rican operating a small farm lives well, he does not have a large cash income. At the present time the cost of insecticides and equipment for their application is expensive, and not many proprietors of small holdings can afford the outlay.

Still another reason is that during the principal productive period, the rainy season, daily precipitation makes spraying and dusting difficult. The torrential downpours occurring in the central plateau, especially from September to

Corn earworm damage at Cairo in the Atlantic lowlands.

Mr. Knight was Assistant Professor of Entomology at the University of Maryland for many years. During the past 2 years he has worked as entomologist with the Cryptostegia Rubber Project of the *Société Haïtiano-Américaine de Développement Agricole,* Port-au Prince, Haiti, making a survey of the insect pests of the *Cryptostegia grandiflora* plant, and also with the food missions in some of the countries of Central America and in Peru. All photographs used in this article were furnished by the author.

November, make agriculture somewhat discouraging. The rainfall at San José is nearly 80 inches annually. In some of the lowlands where rainfall approaches 250 inches little agriculture is possible.

It does not follow that scientific methods of insect control cannot be adapted to Costa Rica, or that spraying and dusting are not practical. Many growers of tropical fruits spray or dust regularly with good results, and there is a small but steady demand for chemical poisons and equipment in the stores of San José. There is little doubt that in a few years insecticides and equipment far more efficient and cheaper than those now available will be developed. Much can be done to assist the farmer in producing a crop in spite of insects. The Costa Rican Ministry of Agriculture, the National School of Agriculture, and more recently the Institute of Inter-American Affairs have encouraged the distribution of pest-control information, and many farmers are coming more and more to depend upon this type of aid. The Inter-American Institute of Agricultural Sciences at Turrialba, Costa Rica, also should be able to help solve some of the problems of tropical entomology.

Methods Determined by Conditions

Over a long period of time the farmer of Costa Rica has developed a system of insect control, though he may not have thought of it in such terms. The agriculturists who seek to improve the health of crops will do well to follow this lead and to improve it scientifically. This method has been the continual elimination of varieties and species of plants that do not withstand the rigors of local conditions. Correlatively, one of the greatest opportunities is in the selection of the most vigorous and resistant varieties or strains of local crops, a process which should be carried on for many years. There have been altogether too many examples of the importation of high-yielding or otherwise desirable varieties of fruits, vegetables, and field crops into Central America. The assumption has been that these plants would duplicate their performance in their new home, something they almost never do. Much of the improvement will have to be made through the use of native or locally adapted species and varieties, though the possibility of hybridizing many of these with others from the north and south is not to be ruled out.

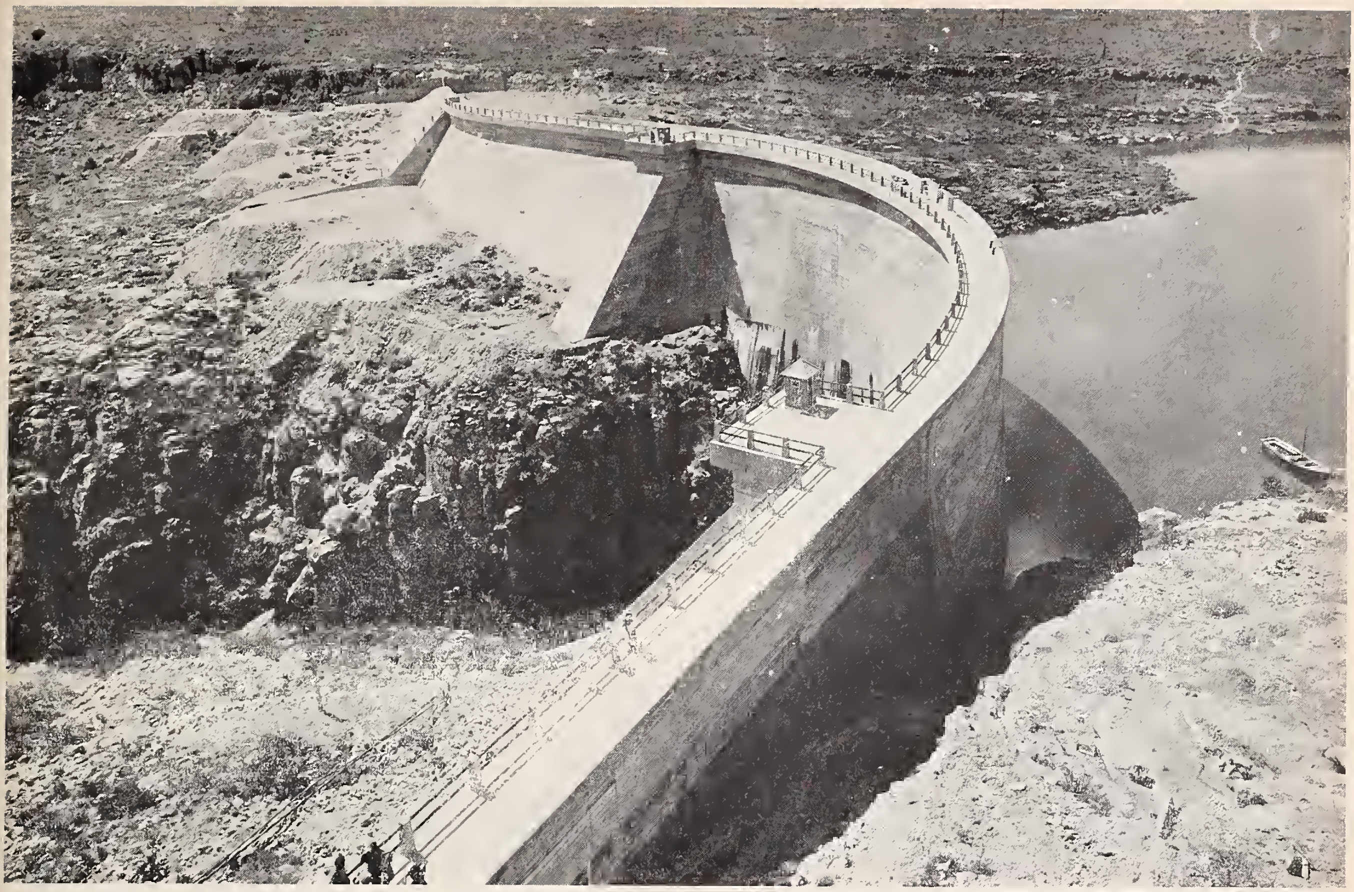
One method of pest control that is within reach of the farmer of Costa Rica and which is, perhaps, not being sufficiently exploited is the practice of field sanitation. On the large coffee *fincas* clean culture and crop sanitation are the rule, but on many of the small farms they are the exception. There is no winter in Costa Rica as northerners understand the term, though the western half of the country has a dry season of about 4 months' duration. This almost rainless period checks the activities of many destructive species, though quite a few feed and breed through it without interruption. But for two-thirds of the year in the main agricultural area most species breed without cessation, there being constant egg laying, larval feeding, pupation, and adult activity. Thus generations are not regular and distinct but rather continually overlap, all stages of many pests being found to occur simultaneously. This makes even more important than in colder climates the destruction of crop residues and plants that have been hopelessly injured but may still harbor many of the insects that caused their lack of productiveness. Crop sanitation is not invariably effective, but in the absence of information to the contrary it is usually a safe procedure. Some farmers believe that it is preferable to plow residual matter into the soil rather than to burn it, though in many areas in Central America burning is a standard practice in order to clean fields for the next crop.

Important Insect Problems

There are a number of insect problems in Costa Rica that stand apart from the others in importance. For some of these no adequate control measures have been worked out; for others, methods are known and only require application. The most destructive insect in the entire nation, as with the United States and other countries, is the malarial mosquito (*Anopheles* spp.), carrier of malaria. This disease is serious up to about 1,200 feet altitude and is by no means rare much higher. The torsalo or nuche fly (*Dermatobia hominis*) of cattle and oxen is a relatively new pest still in process of dispersal. This insect in its larval stage causes severe warbles or cysts in the sides and backs of animals. It is abundant in many of the lower and middle altitudes but is seldom found much above 5,000 feet elevation.

The leaf beetles of the genus *Diabrotica,* of which there are no less than eleven species, attack a great variety of plants and are especially destructive to vegetable crops. The migratory locust (*Schistocerca paranensis*) is of sporadic occurrence in the Pacific lowlands but often reaches terrifying proportions. The most noxious general plant feeder in the central plateau is the leaf beetle *Nodonota irazuensis,* which has probably a larger host-plant list than any other economic insect in the country. Although nearly all agricultural crops have one or more species of plant lice or aphids (*Aphidae*), tropical fruits seem to be most severely affected. During the peak of the rainy season there is a noticeable falling off in the damage caused by aphids. In the lowlands and up to about 4,000 feet leaf-cutting ants, especially the species *Atta sexdens,* cause great injury by stripping trees and shrubs of their foliage. The fire ant (*Solenopsis geminata*), a vicious biting insect, is a general pest but is particularly injurious to citrus fruits and the avocado. Few species of plants are free from leafhoppers, a vast group belonging to the homopterous family *Cicadellidae.* Many of the leafhoppers transmit virus diseases in the United States, and there is every reason to believe that they are equally dangerous in this respect in tropical

(Continued on page 217)



Courtesy of Pan American Union

A modern dam in the State of Aquascalientes—typical of many that are furthering Mexico's agricultural development.

Mexico Reports

In July 1942 Mexico was host to the Second Inter-American Conference on Agriculture. Each participating country was requested to report its accomplishments in carrying out the resolutions adopted there. Mexico is the first republic to publish its report. This is a summary of that report.

by **PHILIP LEONARD GREEN**

The Second Inter-American Conference on Agriculture, held at Mexico City in July 1942, was an effort to mobilize the agricultural forces of the Western Hemisphere.* What the 21 participating republics have done since the Conference adjourned to carry out the resolutions adopted there is a matter of great interest. Mexico is the first to report.

The 1942 Conference addressed itself to a variety of problems. To follow its deliberations and peruse its 76 resolutions is to run virtually the entire gamut of agricultural interests. The subjects covered in these resolutions may be grouped roughly into activities designed to conserve resources, increase production of certain commodities, combat plant and animal diseases, and promote the physical and mental well-being of the rural population. They include, among many others, such topics as agrarian policy and legislation, agricultural credit, control and inspection of cattle, cooperatives, agricultural and forest and soils surveys, rural electrification, labor conditions, inter-

---

* "Agricultural America Mobolizes", by Ralph H. Allee, in AGRICULTURE IN THE AMERICAS, September 1942.

Courtesy of Pan American Union

An old method of irrigation used for many hundreds of years but now rapidly disappearing.

national commodity agreements, the Pan American Highway, maritime transportation, farm and livestock insurance, irrigation, student exchange among agricultural universities, suggested activities of the Inter-American Institute of Agricultural Sciences at Turrialba, and the establishment of a Permanent Committee of the Conference.

Mexico's report shows real progress in furthering the objectives sought by these resolutions. While some of the activities outlined in it may have antedated the 1942 Conference, there can be little doubt that they were considerably stimulated by the united action taken there. In an article of this nature full justice cannot be done to Mexico's report, which contains over 100 pages. The interests touched upon here represent, therefore, little more than highlights of accomplishment.

Forest Resources Surveyed

Concerning the conservation of resources, Mexico reports that it has now completed a chart of forest resources covering the entire country and has also had special charts made covering the forest resources of the States of Hidalgo, Puebla, Querétaro, and Tlaxcala. A new forest law has been prepared, aimed at the rational use of forest resources. Another objective has been to find better uses for forest products. Among other matters of concern to those responsible for this law are the prevention of forest fires, the control of waste, protection zones, erosion, and reforestation. One of the provisions of the law prohibits the felling of trees on an incline greater than 15 percent.

Two permanent experiment stations are planned. One, in the northern part of the country, is to undertake research on temperate forest products. The other, in the southwestern region, will work on tropical woods. Studies covering vegetable carbon, mahogany, and ixtle have already been undertaken. Recommendations have been prepared and sent out for the building of windbreakers. At the port of Tampico work has been undertaken to fix the location of sand dunes which were menacing the oil refinery, the terminal, and the National Railway tracks there. Similar projects are being planned for the ports of Veracruz, Puérto México, and Santa Cruz.

The Office of the Director of Forests has stimulated interest in forest products among chambers of commerce. Measures have been taken to study substitutes for vegetable carbon, such as petroleum distillates, waste material, and mineral carbons. Provisions have been made for the immediate reforestation of zones previously exploited for the purpose of obtaining vegetable carbons. Causes of forest fires have been studied. A number of observation towers have been built, and patrols protect the forests during the dry season.

Soil Conservation and Irrigation

Soil conservation has been a subject of national concern to the Mexican Government for some time, the report states. The first soil-conservation study was made in 1939 in the Tenancingo region of the State of México. This brought out the fact that crops were being raised on land sloping as much as 39 percent. In 1940, a classification of soils was undertaken and the authorities became convinced that erosion was taking its toll. In view of the fact that the districts under irrigation are among the most important agricultural zones of the country, it was decided to establish a Soil Conservation Department as an agency of the National Irrigation Commission. The head of this office was a recent visitor to the United States, where he studied the administration of our own Soil Conservation Service.

Closely allied to this problem is that of irrigation. Through the afore-mentioned National Irrigation Commission, the Mexican Government is carrying out a vast program which takes more than 10 percent of the national budget. This Commission is making a study of the country's water resources, starting with rivers, on which important work is in progress. The possibilities for marketing electric current are being studied. At the present time about 80 irrigation projects are under construction.

The author is Latin American Specialist in the Office of Foreign Agricultural Relations. He has contributed many articles on the various Latin American countries in previous issues of AGRICULTURE IN THE AMERICAS.

Rural Electrification

Rural electrification is another important topic which came up for attention at the Second Inter-American Conference on Agriculture. The Mexican authorities speak of rural electrification as a part of regional electrification. In 1937, a regional system for the generation and distribution of electricity was set up, based on the non-profit system. Generating plants were built and transmission lines and networks were strung. Some of these were linked up with private systems. Small communities have benefited most. The Federal Electricity Commission's policy of undertaking repairs on the basis of long-term loans at a low rate of interest has saved systems which otherwise might not have survived. The work of the Commission to date is summarized in the Mexican Government's report as follows: 15 generating plants designed, built, and operated by the Commission. About 92,000 people have been benefited either directly or indirectly, the majority of whom are engaged in farming. The 8 systems already in operation, connected to previously existing networks, have benefited over 51,000 consumers, the greater part of them being farmers. Besides, repair work was done on 16 systems serving over 114,000 people, about half of whom are engaged in farming. At the time the report was made, 18 systems and plants were under construction. Upon completion, 3,214,000 people would be served by them. Of these, about 300,000 are engaged in farming. Despite these advances, the Mexican Government in its report calls attention to the extensive work still ahead.

For instance, in rural centers of 1,500 inhabitants or less (accounting for about 2,000,000 people) about 95 percent of the population does not benefit from electric service. Every effort is being made by the authorities to bring the benefits of rural electrification to an ever-widening clientele, thus carrying out the objective of the resolution passed on this subject at the Second Inter-American Conference on Agriculture.

Courtesy of Pan American Union

Modern irrigation pumps that are displacing the old hand-operated buckets shown on opposite page.

Courtesy of Pan American Union

Irrigation canals such as this bring water to farms in dry regions of Mexico, thus adding to the agricultural wealth of the country.

Agricultural Machinery

Closely allied to electrification is the matter of machinery. Through its Department of Agricultural Machinery, the Secretariat of Agriculture and Development is promoting the use of agricultural machinery even in the most remote districts of the Republic. The Federal Government in Mexico, in cooperation with State governments and farmers, has invested over $252,000 to purchase plows and other agricultural implements. *The Banco Nacional de Crédito Agrícola* and the *Banco Nacional de Crédito Ejidal* are contributing to this work. Many farmers at present are reported as being equipped with modern agricultural machinery.

Inspection of Cattle

In connection with cattle inspection and improvement, to which the Second Inter-American Conference on Agriculture gave considerable attention, Mexico has introduced some changes in its experiment station set-up by eliminating some and increasing the activities of others. A rather extensive study is being made with regard to the zone of influence of each of the national breeding centers. This study may reveal information concerning the different breeds present in the regions served by the various centers.

Closely related to this is the problem of cattle diseases. A proposal has been made to create an inspection commission on biological and pharmaceutical products for the use of veterinarians. An effort has been made to protect the zones which are not bothered by cattle ticks against infestation from those which are. There is a law which prohibits the transportation of tick-infested cattle to unaffected areas. In the States of Guerrero and Oaxaca, there are 6 sanitary brigades fighting against encephalomyelitis (dennigue) in beef cattle. There is a traveling laboratory with necessary apparatus and material to make studies in the field.

Rural Housing

With respect to housing for the rural population, much progress has been reported. Low-price housing projects have been undertaken. A number of State-wide committees have been set up to assist the National Housing Commission in this work. A set of easy instructions has been prepared to enable farmers to build their own houses. These take into account the climatic conditions of the various regions. The Department of Public Health has an office for the planning of workers' dwellings. The National Irrigation Commission, when it built the El Palmito locks in the State of Durango, created the village of Delicias. This involved the construction of houses, schools, and other buildings, as well as the introduction of drinking water.

In the National School of Agriculture grounds at Chapingo, a school and 24 houses have been built at an approximate cost of $49,000. This is in connection with the *ejido* of Netzahualcoyotl, which is to serve as a model for the general improvement of rural living conditions in Mexico.

Through the Department of the Federal District, the Government of Mexico has given special attention to housing conditions in the Federal District. When at least 80 percent of the inhabitants in any rural center within the District have built their houses or when, in the opinion of the Chief of the Department of the Federal District, they have given sufficient guarantee that they will build dwellings in accordance with specifications previously drawn up by him, the afore-mentioned agency will supply free drinking water, drainage, pavements, public lighting, parks, playgrounds, police, sanitation services, and a school, as needed. All rural centers complying with the rules set up by this Department will be exempt from taxes for at least 6 years. At the request of the interested parties, the Department will assist in financing the building of dwellings through the appropriate credit institutions and, in the case of wage earners, will help in enlisting the cooperation of the employers. In already existing rural centers, a period of not less than 18 months will be granted for the payment of repairs to homes.

Ing. Marte Gómez, Mexico's energetic and farsighted Secretary of Agriculture.

The National Housing Commission previously referred to is part of the Office of the Director of Sanitary Engineering of the Department of Public Health. The Commission has grown out of the need for doing away with unhealthful living conditions so far as the economic situation may permit. There are 3 physicians, 3 architects, and subordinate personnel on the staff. Activities of the Commission are divided into 8 categories: Statistics and documents; city dwellings; rural dwellings; economic, legal, and administrative matters; medical and social matters; materials and costs; propaganda, press exchange, and education; and rules.

The Commission has established contact with various State commissions, offering them practical help in building inexpensive, hygienic dwellings. Several studies on planning, demolition, construction, and financing have been carried out. A lesson on rural dwellings has been included as a unit in the corresponding course given to Federal rural teachers. The Commission has drawn up building plans based on the materials available in each region.

Protection of Farm Labor

The protection of farm labor received considerable attention at the Conference. In Mexico, this has long been a matter of special interest on the part of successive administrations. As early as January 6, 1915, a decree for the protection of farm labor was drawn up. This has, of course, undergone several changes. The Agrarian Code of 1940 is the one now in force. It defines the jurisdiction and activities of the various agencies concerned with the welfare of workers, including the distribution of land and water and the setting up of population centers, the reshuffling of communal landholdings, and the setting aside of school properties. Since 1917, the Mexican Government has undertaken to aid the farmer financially through credit facilities operated on a cooperative basis. Moreover, the General Office of Rural Economy, an agency of the Secretariat of Agriculture and Development, is making technical studies on farm costs. These are designed to help the more efficient farmers evaluate the results of their efforts.

Agricultural Credit and Insurance

Agricultural credit in Mexico is organized under the Agricultural Credit Law of December 31, 1942. This

Courtesy of Pan American Union

Mexico is providing a new type of dwelling as part of a program for rural development.

covers the functions of the *Banco Nacional de Crédito Agrícola,* which deals with the needs of small property owners, and the *Banco Nacional de Crédito Ejidal,* which has jurisdiction over credits extended to collective organizations. Through these two institutions, Mexico is carrying out the objectives of the resolution on agricultural credit.

Agricultural and cattle insurance, another matter brought up at the Second Conference, has received considerable attention. The Government of Mexico started by insuring wheat crops against hail storms, in the Laguna region, with activities centered at Torreón. The National Agricultural Credit Bank set up an insurance organization of the mutual type. While the various insurance companies could be self-sufficient, they belong to a Federal organization called the *Instituto Mutualista de Seguros Agrícolas.*

Farm Training

Rural agricultural education was an important point of discussion at the Second Inter-American Conference on Agriculture. The Government of Mexico has undertaken several activities designed to give effect to the resolution passed on this subject. For instance, a projected Presidential decree was prepared, covering primary, intermediate, special, and professional education in this field. At the present time, agricultural courses are being given at 16 practical agricultural schools controlled by the Federal Department of Agricultural Education. This education is calculated to give future farmers the skills necessary for the economical exploitation of the land, of domestic animals, and of industries derived therefrom, and to help promote better economic and social conditions in the rural districts. The curricula are not limited to scientific subjects but include even such items as personality development, so that the students may learn to become useful factors in their social group. Graduates of agricultural schools are encouraged to form local agricultural and credit associations. Special courses for agricultural teachers are also receiving attention. Over $400,000 have been appropriated for agricultural education.

Aid to the United States

Considerable importance was attached to the urgency of inter-American cooperation on a number of problems common to two or more American republics. One of the ways in which this cooperation has been promoted is through the supplying of Mexican agricultural workers to farmers in the United States. This has been made necessary by a critical shortage of manpower in this country. Special Mexican inspectors located in the United States protect the interests of the Mexican workers and facilitate their dealing with the United States authorities. The Mexican Department of Health makes sure that those who are sent to the United States are not suffering from diseases.

Mexico has also participated in the rubber program. Agreements were signed in 1941 and 1942 with the U. S. Department of Agriculture for the planting of hevea trees in the El Palmar Zone of Vera Cruz State and for the subsequent distribution of budded stumps to interested farmers. Under the second of these agreements, Mexico undertook to set up rubber demonstration centers at five different locations. Mexico and the United States have also signed a treaty concerning the sale of rubber on a reasonable basis.

A special resolution on collaboration with the U. S. Department of Agriculture also was passed at the Second Inter-American Conference. The Office of the Director General of Agriculture in the Secretariat of Agriculture and Development has been in charge of carrying out this resolution. Mexico has informed the Department of Agriculture that it is prepared to consider the Bureau of Plant Industry as headquarters for the exchange of planting materials among the American republics.

One may conclude that Mexico has made a strenuous effort to give effect to the resolutions passed at the Second Inter-American Conference on Agriculture. There is hardly a major field of agricultural science which is not comprised in this record of achievement. Furthermore, Mexico has been host to the Permanent Committee which grew out of the Second Conference and which is functioning as a continuing body until the third Conference meets in 1945.

Courtesy of Pan American Union

Students of the Central Agricultural School of Hidalgo proudly display the products of their agricultural projects.

A Brazilian Evaluates a Neighbor

This is the story left by a Brazilian doctor when he returned to Brazil last August after 15 months of study in the United States. He is one of the 80 students from the other American republics receiving training in agriculture and Extension Service methods in this country under scholarships provided by the Department of State and the Institute of Inter-American Affairs.

by EDUARDO C. PINHEIRO

The second World War has shown the necessity for unity of the Americas and has demonstrated the interdependence that exists among our nations. It has also proved that while the United States has tremendous industrial potentialities many essential materials for these industries must be imported from other sources. If the other Americas are the sources of those vital raw materials, they are also markets for manufactured United States products.

That it took a war to bring us closer together is lamentable. But, even if the common danger was the immediate cause, the fact is that we now are united. This unity of the Americas can be maintained through the new conception of friendship which we now hold.

The Good Neighbor Policy is the basis for this new concept. Upon its sound principles inter-American solidarity can be founded. The United States has given us an example of its willingness to cooperate, in its Inter-American training program. Through this program scientists and technicians from all over the Western Hemisphere are coming to this country to study its culture, its techniques, its accomplishments, its progress. That should be proof enough to the other Americas of the will of the people of the United States to help all of them build that peace, freedom, and security for which we have been fighting.

This is my strongest reaction after living in this country as one of the students of the Training Division of the Institute of Inter-American Affairs. I feel that it should be told to the people of the United States as well as to the people of the other Americas.

I Come To This Country

The telegram from the United States Consul inviting me to come here for a period of study and travel was a great surprise. My first reaction was a series of conflicting emotions. Elation over the opportunity offered and an appreciation of the honor extended were mixed with a certain dread of venturing abroad into a country where only English is spoken. Since my college days, however, I had been dreaming of closer ties between Brazil and all other nations, and my belief in that necessity was largely responsible for my decision to accept the invitation. Through study and travel I would be able to find out for myself about the United States and its people.

In May of 1943 I landed in Miami, Florida, and in my first contact with the new country I heard so many times one phrase that I learned it: "May I help you?"

Two days after landing in Miami I was in Washington. Impressions were thrust upon me in kaleidoscopic succession as I beheld the beauty of the city, its monuments, its institutions, its parks, and its crowded streets. These impressions were all the more confusing because I could not share them, knowing no one with whom I could talk.

My confusion began to be dispelled as I worked in a language school. There I improved my English sufficiently to start traveling.

Going South

My first program, organized by the Department of State, took me to Atlanta, Georgia, to study malaria control at the malaria-control office in that State. Through the friendliness and helpfulness of the teachers of this organization and the officials of the Department I was able to get along on my meager knowledge of English.

The stay with the doctors and engineers in charge of the malaria-control work gave me my first conception of the extent of public-welfare work in this country. Especially impressive were the miles after miles of ditches, draining extensive areas. I began to comprehend the completeness and magnitude of the work on malaria control when all phases of the work proved to be characterized

---

The author is a 32-year-old medical doctor from Monte Alegre, State of Pará, Brazil, who has a strong desire to improve the health and living conditions of the less fortunate of his country's people. After his study of agriculture and of the methods of the Extension Service of the U. S. Department of Agriculture, he has returned to his own country to work in cooperation with the Brazilian-American Food Commission.

by the same extensiveness and efficiency which I saw in the drainage projects. This impression was further substantiated by a study of the malaria-control work being conducted by the Memphis and Shelby County Health Department at Memphis, Tennessee.

Going North

Following the studies made in Georgia and Tennessee, I visited hospitals and health centers in the City of New York. New York is the city in this country best known to all Brazilian people. Motion pictures are responsible for that. They are also responsible for our thinking the entire United States a country of skyscrapers and of such great-and-equally-distributed wealth that there are no economic problems. Certainly New York is impressive; its health centers are models and it has many great hospitals. But in viewing some of the less fortunate housing areas of New York, I began my first observations of some of the social problems of this country.

The author (right) points to Monte Alegre, State of Pará, Brazil, where he practiced medicine prior to accepting a scholarship for study in the United States. Looking on is Dr. F. P. Frutchey, of the Division of Field Studies and Training, U. S. Extension Service.

Rural North America

After the conclusion of my program of study with the Department of State, a scholarship was granted by the Food Supply Division of the Institute of Inter-American Affairs to study food and nutrition, rural health programs, and rural welfare. For this I went back south to Arkansas, where I saw a wide range of living conditions. Being interested in observing all aspects of farm life, I went to work as an apprentice farmer on the 500-acre farm of Neal Bickerstaff in Lee County, Arkansas. By working with the sharecroppers on the farm I came to know their conditions of life, their feelings and reactions, and the problems of the farm management systems there.

To an inhabitant of the Amazon Valley of Brazil who had known some of the difficulties of farming in that region. the advantages of modern improved farm machinery in increasing both production and efficiency were soon evident. I began to realize how much we need to do in some sections of Brazil to modernize farming practices and how much we could do by assimilating some of the more modern farming methods which could be adapted to our own conditions. I also saw more clearly why it may be necessary to adopt some of these methods if we are to improve conditions as much as we hope to do.

The experiences on the Bickerstaff farm and in the Moro community, in which the farm is located, gave me a clear picture of the high standards of rural living which have been achieved in the United States. These high standards, however, are not enjoyed by all rural people. I discovered that the problem of providing economic security for sharecroppers and many of the tenants and owners of small farms is still to be solved.

Agricultural Extension Work

From the Bickerstaff farm I went to Marianna to study the teaching methods of the Agricultural Extension Service. With William Spivey, the county agricultural agent, I visited farms and plantations, saw practical demonstrations of soil fertilization, irrigation, and vaccination of animals, and witnessed the day-by-day guidance which he provided on all phases of production and farm management.

With Miss Eutha Olds, county home demonstration agent, I visited many farm homes and attended home demonstration club meetings. I learned that rural women, through these clubs and the assistance of extension workers, were carrying out a program designed to make farm life more comfortable, to improve the diets and health of the members of the farm family, to provide practical instruction in everything connected with home and civic education, and to develop cooperation in behalf of the general welfare.

With both the agents I attended meetings of all the 17 4-H Clubs in the county and, after observing the individual work and the joint activities of the 545 4-H Club members, I firmly believe that this organization for teaching boys and girls improved methods of farming and homemaking represents the most solid foundation for the future of successful American rural life. In addition to the techniques which they acquire through their demonstration work, knowledge obtained through "learning by doing," they are taught such wholesome principles as appreciation of rural life and love for their country.

Rural Health Programs

During this second training period spent in the South I also visited the States of Texas, New Mexico, and Oklahoma to study medical, hospital, and dental services organized on a cooperative basis. In Elk City, Oklahoma, the organization of the first cooperative hospital established

(Continued on page 218)

ALONG THE *Agricultural Front*

▲ Brazil Uses Refrigerators To Increase Silk Culture

Brazil, which has every other facility for silkworm culture except cool weather, is now employing refrigerators to speed up the life cycle of the silkworm from the cocoon to butterfly stage, thereby producing more eggs and young worms and increasing silk production to comply with war requirements. Silk is widely used in parachutes, powder bags, and other war materials.

Experiments with refrigerators have shown that as much as ten crops of cocoons may be produced in one year through the proper application of cool air, and a number of refrigerating units have been installed in at least one experimental station in Brazil to accelerate the production of silkworms.

Brazil is also carrying on wide experimentation with 300,000 mulberry trees to find the most satisfactory strains for the silkworms. Brazil's climate is ideally suited to the production of mulberry trees.

▲ Colombian Credit Institute Makes Annual Award

A Colombian family of four, living on 4 acres devoted to coffee trees and pasture in the Department of Caldas, was this year's winner of the prize offered by the Colombian Institute of Territorial Credit. The award is made by lot among the home-builders who have made use of loans offered by the Institute and whose record for punctual payments is perfect. The award consists of remission of all future payments, so that the lucky borrower at once receives full title to his property.

This year's winner, according to information received recently, had borrowed about $425 for a term of 30 years and had used it to build a neat tile-roofed cottage with kitchen, hallway, two bedrooms, and built-in closets. Since the Institute began operations 4 years ago hundreds of families have been enabled to build comfortable homes by long-term loans at low interest rates.

▲ Rabbits and Hares For Export or For Hats

Three facts remain undisputed in Chile: Rabbits have been plaguing farmers; the skins are valuable to the flourishing hat-manufacturing industry in Chile; trappers must be assured a legitimate gain.

Hence, considerable stir was caused among hat manufacturers in Chile by the recent announcement that the exportation of rabbit and hare skins from Chile would again be permitted. Hat manufacturers called to the attention of the Ministry of Economy and Commerce the importance of the hat industry to the country, with its last year's domestic sales of $9,375,000 and its estimated exports for next year of over $2,000,000. They stated that skins for the making of hats were in such short supply that last year as many as 750,000 skins had to be imported, and that a previous agreement had been made that no exports would be permitted as long as the industry paid over 2.09 cents per skin, a price which it was at that time paying.

At a meeting arranged between government officials, hat manufacturers, exporters, farmers, and trappers, the agreement was reached that local manufacturers would have first chance at the skins offered on the market but that they must turn over for export any surpluses that might arise. As an immediate result, the price offered by the Central Purchasing Office of the hat industry for rabbit and hare skins became 2.8 cents for rabbit skins and 3.75 cents for hares (winter quality).

▲ Brazil Erects Large Tannin Factory

The largest factory which has yet been erected in South America for the manufacture of tannin was recently completed at Porto Murtinho, territory of Ponta Porã, formerly Mato Grosso, Brazil. Quebracho is the raw material which is used to make tannin. The manufacture of tannin is considered the third largest industry in Brazil.

▲ Kenaf Harvester Demonstrated in Cuba

A tractor-drawn, power take-off binder with a six-foot cut that has been modified to handle plants with an average length of 9 feet has been adapted for harvesting kenaf or roselle fiber in Cuba. The machine was originally designed to harvest hemp in the United States.

Tests have shown that the machine will work best with plants that are about 110 days old and planted close together in rows 8 inches apart. Plants grown in this manner have few branches, average about 8 feet high, and are only one-fourth to three-fourths of an inch in diameter.

The harvester will cut about one acre per hour. The average yield of green material cut is slightly above 20,000 pounds or 10 tons per acre. The plants are tied into bundles weighing about 32 pounds each, a size which is convenient for handling. An elevator may possibly be developed later which will load the bundles directly into a wagon or truck carried alongside of the harvester.

▲ Cuban Producers Organize to Study Economic Problems

Cuban producers have recently organized the *Confederación de Productores de Cuba,* the object of which is to study the social and economic problems resulting from the war and to aid in their solution. Specific aims of the confederation include the encouragement of employers to protect and develop the country's natural resources; promotion of new agricultural and industrial activity; insuring of maximum production by established industries to meet Cuba's requirements; and the encouragement of expansion and improvement of transportation facilities as an aid to the development of national production.

▲ Peru Produces New Insecticide Powder

Peru recently began the production of a new insecticide powder, known as Babbini, which will be used against pests attacking the cotton plant. Production of the new insecticide at present is estimated at 1,000,000 pounds annually but plans for the future call for a production of 4,000,000 pounds a year.

THE GUAYAS BASIN–ECUADOR

(Continued from back cover page)

from Guayaquil to Salinas on the Pacific and from Duran, opposite Guayaquil, to the capital, Quito, in the Sierra. All the cities and larger towns have telegraph connections, with outside cable connections through Guayaquil, which has also a modern airport.

Industries

Agriculture is the chief industry, followed by forest exploitation. The basin produces rice, cacao, coffee, sugar, tobacco, cotton, castor beans, bananas, plantains, citrus fruits, papayas, pineapples, mangoes, avocados, coconuts, cassava, cereals, beans, numerous other fruits and vegetables, balsa, rubber, cinchona bark, tagua nuts, toquilla straw, kapok, beef, pork, dairy products, mutton and wool, poultry products and fish—a long and impressive list. Of these, rice, cacao, coffee, bananas, balsa, rubber, cinchona bark, tagua nuts, toquilla straw (as Panama hats), and kapok are exported.

Mining occupies a minor place in the basin. One mine in the Province of Cotopaxi produces copper and gold.

Manufactories, practically all of which are in or not far from Guayaquil, consist of rice mills, sugar mills, brick and tile plants, railway shops and car foundry, machine shops, brewery, several large sawmills working balsa, meat slaughtering places, small ship-building establishments, and a number of small garment and shoe factories. Many items in common use, such as furniture, clothing, and luggage, are made by individuals or in small shops on order.

Commerce is the chief industry of Guayaquil. The city has no docks because of river sediment, the ships anchoring in the channel and discharging and receiving cargo by lighter. Through this port pass all the products of the basin and most of those of the Sierra destined for foreign markets. Conversely, about 90 percent of the imports of Ecuador arriving by ship are unloaded at this port since, because of the railroad, it is the gateway to the Sierra and to the basin.

The natural wealth of the Guayas basin has scarcely been touched. It is picturesque and, with increasing modern improvements, is a pleasant place effort it is worthy of careful consideration.

AN ENTOMOLOGIST LOOKS AT COSTA RICA

(Continued from page 208)

America. The cotton stainer (*Dysdercus mimulus*) is a general feeder in both rainy and dry seasons.

White grubworms (*Phyllophaga* spp.) are very serious feeders upon root vegetables such as potatoes, carrots, and beets. Cutworms (*Noctuidae*) are serious in vegetable gardens and show an especial liking for newly transplanted tomatoes and cabbage. Garden squash are a difficult crop to raise because of an unfortunate complex of destructive pests, especially the pickleworm (*Diaphania nitidalis*), the bean ladybird (*Epilachna borealis*), the squash-vine borer (*Melittia cucurbitae*), and two species of squash bugs (*Anasa*). The major pests of cabbage are the southern cabbage worm (*Pieris protodice*), the diamondback moth (*Plutella maculipennis*), and the cabbage aphid (*Aphis brassicae*). Recent interest in onions as a profitable export crop has resulted in severe infestation of the onion thrips (*Thrips tabaci*), though certain types seem to produce well in spite of this pest. The corn earworm or bollworm (*Heliothis obsoleta*) is a major pest of tomatoes and minor one of corn. Flea beetles, especially of the genera *Epitrix* and *Haltica,* are injurious to a wide variety of plants but are especially severe on corn, potatoes, tomatoes, tobacco, and beans.

Many of the fleshy tropical fruits are attacked by fruitflies (*Anastrepha* spp.). If fruit production in Costa Rica is stimulated to anything near its potentialities, these insects will be among the most serious handicaps in the entire country. The same may be said of many cosmopolitan species of scale insects and malybugs. The papaya fruitfly (*Toxotrypana curvicauda*) causes considerable damage to the papaya in the highlands but appears to be insignificant, if not entirely absent, in many of the lowland areas.

Probably the most injurious pest of the coffee plant is the coffee leafminer (*Leucoptera coffeella*), though coffee does not suffer severely from entomological ailments. The sugarcane borer (*Diatraea saccharalis*) is found wherever cane is grown. Because of the lack of sufficient storage facilities, stored-grain pests are severe. All the cosmopolitan species of moths and beetles known to attack stored grain, flour, and seeds are present in Costa Rica. Termites, especially of the genus *Kalotermes,* are destructive except at the higher elevations.

Pest Control a Universal Problem

Costa Rica is one of the richest agricultural regions on earth, one with much room for future development. As the cultivation of crops both for local use and for export progresses, new insects will appear and native species not heretofore regarded as pests will become destructive through changed environmental conditions. Alien species will likewise be imported through the channels of commerce, and indigenous types may be inadvertently sent abroad. Some of the latter which have not been regarded as pests in their place of origin may become destructive in their land of adoption. The coming air age will make such widely separated places as San José, Washington, and Montevideo over-the-fence neighbors, and then what happens in once-remote places will become matters of great importance to the entire hemisphere. An apparently innocuous insect in Costa Rica might be a serious invader in the United States, and the reverse can be equally true. The study of insect life in tropical America is no longer the pastime of butterfly chasing on the slopes of Volcan Turrialba.

A BRAZILIAN EVALUATES A NEIGHBOR

(Continued from page 215)

in the United States was interesting. It is a private enterprise owned and maintained cooperatively by 5,000 farm families. In Taos, New Mexico, and Linden, Texas, I observed the operation of health cooperatives partially supported by funds from the Federal Government granted through the Farm Security Administration.

My Conclusions

Born and reared in the Amazon region of Brazil and having seen something of the hardship of a portion of its people, I could not help turning my thoughts toward Amazonia and its people when I saw the things I have summarized. Amazonia is finding its way toward rehabilitation. In this it is being aided by the Brazilian-American cooperation which has made possible the work of the Public Health Special Service and the Brazilian-American Food Commission. The human problems of the Amazon Valley could be further alleviated, I believe, by developing an Agricultural Extension Service along the characteristic educational lines of the work in this country, the methods and organization of which could be adapted perfectly to the conditions in the rural districts of Brazil. The Agricultural Development Service already established in Brazil can well be considered the first step in establishing this work among us.

As I prepare to return to my own country, I know that the impressions which will always remain are my admiration, friendship, and gratitude toward the people of this great nation, for the hospitality which I received everywhere and for all which I have learned.

On my return to Brazil I hope to dedicate myself to the preservation of the ideal of Pan American solidarity.

●

A constitution was promulgated for the union of the Central American nations, or the Central American Confederation, on November 22, 1824.

Reading about the AMERICAS

The Commercial Timbers of Mexico, by Arnold Joerns. 21 pp. Arnold Joerns, 333 North Michigan Ave., Chicago, Illinois, or Despacho 101, Gante 15, Mexico, D. F.; 1944. A vest-pocket-size, briefly descriptive catalogue, listed alphabetically, of the various species of tropical woods and of those growing at higher-than-tropical altitudes, in Mexico. The names used for the tropical woods are those known to the people in Mexico and to the Mexican lumber trade rather than the botanical names.

The Wonderland—Ecuador, by Raphael V. Lasso. 296 pp., illus. Alpha-Ecuador Publications, 2 Broadway, New York; 1944. A handbook of facts and data on the history and life of Ecuador, designed for "the student or tourist, the exporter or bank-clerk, the flyer and the commercial traveler."

It contains chapters on the physical formation of Ecuador, the pre-Inca history and civilization of the country, its government, language, religion, art, climate, flora, industries, minerals, agricultural products, forests, economics, and ethnology. The chapter on products tells of Ecuador's balsa wood, rubber, cinchona, kapok, cocoa, coconut, gums, vegetable wax and oils, tanning and dyeing materials, medicinal products, and fibers. The chapter on forests includes material on the so-called precious and commercial woods. There are many illustrations of the physical features, buildings, products, and people of Ecuador.

Stories From the Americas, collected and translated by Frank Henius. 115 pp., illus. Charles Scribner's Sons, New York; 1944; (Price $2.00). This is a children's book of stories from twenty of the American republics, from Mexico through Central and South America. Some of the stories came over from Europe and were modified and changed by the countries to which they came; others are Indian legends. They were selected by Latin Americans as stories that are favorites with the children of their countries. There are many amusing illustrations.

Editor's Note.—The listing of publications here does not necessarily imply an endorsement of them by the Department. For copies of private publications, write direct to the publishing agency given in each case.

AGRICULTURE IN THE AMERICAS O. R. CARRINGTON, EDITOR

A monthly publication of the Office of Foreign Agricultural Relations of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 10 cents per copy, or by subscription at rate of 75 cents per year, domestic; $1.20 per year, foreign. Postage stamps will not be accepted in payment.

Gifts of the Americas

THE TURKEY

by SOPHIA PODOLSKY

More than 400 years ago Cortez and his followers in Mexico saw a strange new bird. They believed it to be a species of peacock because, as it strutted along, it had a garnet and gold tail "spread" that reminded them of the Indian peacock. It proved to be the "cheapest meat" in Mexico at the time, and Montezuma fed it to the eagles and vultures in the royal aviaries. The Spaniards named the new bird *gallipavo,* and dispatched it, along with a number of other Mexican souvenirs, to their emperor, Charles V.

A century later the "American peacock" formed the centerpiece of the feast prepared by the Pilgrim Fathers in solemn thanks-giving for the completion of their first year in the new land. Today the domesticated turkey has become so thoroughly established as part of the Thanksgiving tradition that to servicemen from this country who are now located in many parts of the world it looms large in the anticipations of the holiday season.

How then did the *gallipavo* become known as the turkey? Where did it fall out of line with the peacock of the Anglo-Saxon *pawa,* the German *Pfau,* the French *paon,* the Latin *pavo,* the Indian *pavon?* If we trace back to the Tamil language of India, we find the word *toka,* meaning train or trailing skirt. Adapted into Hebrew, *toka* became *tukki.* From there was it only a step to the Anglicized word turkey?

Some writers have suggested that the name "turkey" was adopted because of the supposed resemblance between the adornments of the fowl's head and the fez worn by Turkish citizens. Still others believe the name bears some resemblance to the bird's repeated call notes—"turk, turk, turk."

There is evidence that turkeys were in existence even before Cortez first sighted them on his travels in Mexico. Turkey bones dug up in the Tennessee Valley indicate that the Indians used wild turkeys as a source of food as far back as 1,000 A.D., and perhaps earlier. A frieze with eight medallions depicting turkeys, below a thirteenth century mural in St. Peter's Cathedral at Schlesing, opens up the possibility that live turkeys were sent from "Markland" or some other part of North America to Northwest Europe by the Norsemen prior to 1280 A.D. Authorities have decided that these medallions were painted around that date. This would seem to open up a field for speculation regarding the development of turkeys in Europe, which at best is only a speculation since there is no other historical evidence that turkeys appeared in Europe prior to 1519.

The turkey spread from Spain throughout Europe and England, being introduced into the latter in 1524. There is an old English verse to the effect that:

> "Turkeys, carps, hoppes, picarel and beer,
> Came into England all in one year."

As late as 1541 the domestic turkey was still a rare bird. In that year, one writer tells us, "Archbishop Cranmer prohibited the appearance at State festivals of more than one dish of turkey cocks; the female was too precious to be cooked at that period. Fourteen years later two turkeys and two turkey poults were served at a grand law dinner. Twenty years afterwards the turkey became a Christmas dish with the farmer."

The turkey was introduced into Germany in 1530, and the first mention of the bird in Italy was an ordinance issued by the Magistrate of Venice in 1556, "repressing the luxury of serving turkeys." Not many years later, in 1570, the cook of Pope Pius V published recipes for cooking turkey.

Prior to the present war dressed turkeys were imported into the United States from Hungary, Russia, Austria, and Ireland, and in large numbers from Argentina. Thus we find our own native bird completing the cycle and finally "coming home to roost."

Last year the turkey did its part to bring holiday cheer to the millions of American fighting men throughout the world. Thirty-five million pounds of turkey were provided for members of the various armed services, and in spite of this staggering figure there was plenty of turkey for the home front.

Today's turkey, streamlined and scientifically bred to fit the modern-day oven, income, and appetite, is a far different bird from the ocellated turkey of Yucatán, warted and without a wattle, that was served in such abundance to the Aztec emperor's pets.

THE GUAYAS BASIN—ECUADOR

by LEWIS E. LONG

The Guayas River system—largest on the Pacific side of South America—lies wholly within Ecuador and embraces an area of 15,445 square miles.

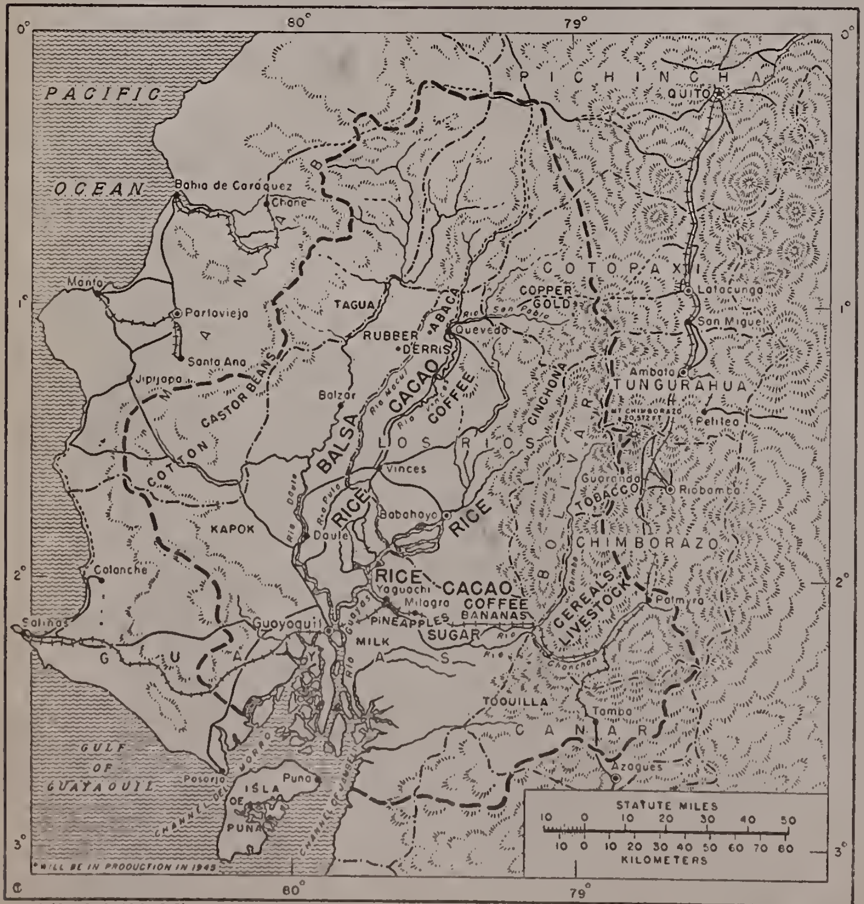
The river enters the Gulf of Guayaquil through the Channels Jambelí and del Morro and is navigable for ocean vessels to Guayaquil, 40 miles from Puna at the river mouth. Above Guayaquil it forms a veritable network of channels which serve as the principal highways of the basin. Ocean tides extend inland for about 35 miles above Guayaquil.

About half the basin area is less than 100 feet above sea level. From this level it rises toward the Andes, where it receives water from the perpetual snow of massive Chimborazo, elevation 20,500 feet, the highest point in Ecuador.

Soils range from sands and undrained river sediments in the lower basin through sandy loams and outwashed soils to those of volcanic origin of the Sierra, which are interspersed with sandy areas and high cold plateaus. The volcanic soils are deep, fertile, and resistant to erosion. They are farmed on steep slopes to the summits of the lower mountains, the limit being set by temperature.

Climate

Most of the basin is tropical, but the higher inhabited areas are temperate without seasonal temperature variations and with almost constant length of day because of proximity to the Equator. Only two seasons are recognized—the rainy season, called winter, from December to May and the dry season, called summer, from June to November. Mean tempe ture in winter is about 80° F. Rain occur at night and the days are usually clear. This is the principal cropping season. Mean summer temperature is about 77° F., and, while rain is rare, there are frequent dense morning fogs and the remainder of the day is usually cloudy. Rainfall varies with elevation and latitude, becoming higher toward the mountains and toward the north. Average annual rainfall is about 40 inches at Guayaquil, and 100 inches at Quevedo. High winds and lightning are infrequent. Earth tren ors are felt frequently and disastrous quakes have occurred.



U S DEPARTMENT OF AGRICULTURE

NEG 373 OFFICE OF FOREIGN AGRICULTURAL RELATIONS

People and Living Conditions

Population of the basin is estimated at 820,000, of which 208,000 live in cities and towns of 2,000 or more. Guayaquil is the principal city, with 152,000 people; Guaranda has 15,000; Babahoyo, 12,000; Daule, 6,000; and Vinces, 5,000. About 20 percent of the people are Indians, most of whom live in the Andean highlands.

Rural health conditions are typical for the Tropics. The larger cities and towns have hospitals, and most towns have doctors. There are no rural schools, but grammar schools exist in the towns; larger cities have high schools, also, and Guayaquil has a university and several colleges. Teaching is in Spanish.

Transportation is largely by water. At the height of the rainy season there are approximately 800 miles navigable to power launches and as many more to 20-ton-burden canoes. Beyond this, dugout canoes carry on. This mileage is reduced by about 50 percent at the trough of the dry season, during which a shift is made to trucks and pack animals over trails connecting the large cities and inland places with the hea of navigable water. Railroads exten

(Continued on page 217)

☆ U. S. Government Printing Office: 1944—611931

serve

752A

Agriculture IN THE Americas

Issued Monthly by the OFFICE OF FOREIGN AGRICULTURAL RELATIONS

UNITED STATES DEPARTMENT OF AGRICULTURE

LIBRARY
CURRENT SERIAL RECORD
DEC 16 1944
U. S. DEPARTMENT OF AGRICULTURE

IN THIS ISSUE

PAGE

The Forest Resources of Chile 223

Hevea Rubber Comes to Honduras 227

Mutual Planning for Progress in Agriculture 229

"Kilometer 47" 232

Along the Agricultural Front 236

Reading About the Americas 238

Gifts of the Americas—Carnauba Wax 239

The Magdalena River Basin—Colombia 240

December 1944

NAMES & NEWS

Chile's New Minister of Agriculture

Señor Manuel Casaneuva, the former Director General of Agriculture in Chile, who attended the International Food Conference at Hot Springs last year, has been appointed Minister of Agriculture in President Rios' new Cabinet.

●

Will Study Fertilizers and Soils

Senhor Domingos Pellegrine, Brazilian agronomist and a member of the staff of the University of São Paulo Agricultural School, has come to the United States as a guest of the Institute of Inter-American Affairs. He will study fertilizers and soils at some North American college of agriculture.

●

Peruvian Visits Cattle Ranches

Señor Joaquín A. Cortez, Chief of the Department of Tropical Animal Husbandry, Ministry of Agriculture of Peru, recently visited the United States as a guest of the Department of State. He came to this country primarily to study the cattle industry. While here he visited ranches and other cattle-raising centers in Texas, Louisiana, Georgia, and other southern States.

Señor Cortez was particularly interested in those breeds of cattle which could be used in the expanding dairy industry of Peru, with special emphasis on the upland regions of that country, where the raising of beef cattle is receiving more attention at present.

●

Dr. Fairchild Goes to Guatemala

David G. Fairchild, North American botanist and founder of the Fairchild Tropical Gardens, left recently for Guatemala and other points in Latin America, where he will carry on research on several species of fruit belonging to the avocado family. He also plans to search for relatives of the sugar apple. Dr. Fairchild has written a number of books in the botanical field, one of the most popular of which is *The World Is My Garden.*

Returns To Brazil

W. Andrew Archer, of the Office of Foreign Agricultural Relations, will soon return to Brazil to continue his work as economic botanist under the cooperative program at the Instituto Agronómico do Norte at Belém. Dr. Archer's work, which is carried on in collaboration with Dr. Felisberto Camargo, Director of the Institute, involves a survey of economic plants in the Amazon region, including insecticides and rubber-bearing plants.

●

To Study Soil Areas

Robert L. Pendleton, of the Office of Foreign Agricultural Relations, left recently for an extended visit to Peru, Brazil, Trinidad, Colombia, Ecuador, Costa Rica, Nicaragua, El Salvador, and Guatemala in connection with the agricultural program for cooperation with the American republics. Dr. Pendleton will work closely with the agricultural schools and experiment stations in the various countries and will conduct soil surveys to determine the best areas for the cultivation of complementary tropical crops.

●

To Survey Latin American Extension Program

Frederick P. Frutchey, of the Extension Service, U. S. Department of Agriculture, will spend the next 2 months in Venezuela, Colombia, Ecuador, Nicaragua, El Salvador, and Mexico, where he will make a study of the extension work of those countries. Dr. Frutchey is particularly interested in the progress of the interchange program for students and specialists which is being carried on in cooperation with the Extension Service.

●

Visits Central and South America

Claud L. Horn, acting Head of the Complementary Crops Division of the Office of Foreign Agricultural Relations, has gone to Nicaragua, Peru, and Ecuador, where he will inspect work being carried on in the production of strategic complementary crops at the Cooperative Agricultural Experiment Stations. He will also consult with officials of the three countries as well as with members of the American Embassies relative to future plans for collaboration.

(Continued on page 235)

Agriculture IN THE *Americas*

Vol. IV. . DECEMBER 1944 . *No. 12*

The Forest Resources of Chile

This article is based upon a report on the forest resources of Chile prepared for the Government-sponsored Chilean Development Corporation, Santiago, under a cooperative project with the U.S. Forest Service.

by **PHILIP A. BRIEGLEB**
and **IRVINE T. HAIG**

The forests and woodlands of Chile, covering some 39,500,000 acres, or 22 percent of the Republic's surface, represent a resource of considerable national importance and a valuable source of post-war timber for other nations. It becomes increasingly valuable in view of the steady decrease in the world supply of both high-quality hardwood from large, clear, old-growth trees and the softwoods which provide three-fourths of the world's supply of lumber.

To meet post-war demands for lumber, new areas of timber land will have to be opened up. Although South and Central America contain large areas of tropical hardwoods which are practically untouched, many of them are almost certain to remain difficult to log economically because of climatic conditions and great variety of species per acre, many of which are of unknown commercial value. Chile's forested areas, however, are in a temperate region, close to water and railhead. Ninety-three percent of the timber is hardwood and is found in stands in which a large part of the volume over extensive areas is commonly in two to five species, and occasionally only one. The species have been tested sufficiently to furnish a satisfactory working knowledge of their commercial properties.

Dr. Haig, who has been with the U. S. Forest Service since 1923, recently became the director of the Appalachian Forest Experiment Station at Asheville, North Carolina. He has served for some time as representative for the Forest Service in cooperative work with Latin American countries. He was in charge of a recent mission sent to Chile to locate, estimate, and map the timber resources of that country.

Mr. Briegleb has been a member of the staff of the Pacific Northwest Forest and Range Experiment Station since 1929. He accompanied Dr. Haig as a member of the Chilean Wood Mission and was in charge of a party locating, mapping, and estimating timber.

Chile's original forest has been greatly reduced by fire and by land clearance for agriculture. Although the

The timber forests of Chile are found in rugged mountain country of picturesque character.

A planted eucalyptus forest under intensive management. Every 15 years the larger trees are cut for mine props and replaced by sprouts as shown in the picture.

remaining forest is small in terms of world areas, it is readily accessible and is largely composed of virgin stands of hardwoods of large size and good quality.

These forests and woodlands are scattered through 38 degrees of latitude. While averaging only a little more than 100 miles in width, Chile is 2,600 miles long—a distance comparable to that from New York to San Francisco. Timber ranges from the scrubby patches of the northern desert areas to the remnants of high forest found in the wind-swept Straits of Magellan and from sea level to timber line on the snow-capped range of the main cordillera. Everywhere the forested areas show a corresponding diversity in composition and general characteristics.

Woodlands in North

In the sparsely inhabited desert region of the north, one of the driest regions in the world, trees occur as watered plantations or as rare patches of scrubby growth suitable only for tannin or fuelwood. Here are found such species as tamarugo (*Prosopis tamarugo*), algarrobo (*Prosopis juliflora*), and carbón (*Cordia decandra*).

Southward, in central and north central Chile, occurs an area which is characterized by a Mediterranean-like climate of mild winters and cool, dry summers. Rainfall is light, and agriculture depends primarily on irrigated water from the never-failing snow fields of the Andes. The natural vegetation is an open woodland or scrub growth. According to early reports, this *matorral* (shrub or thicket) occurred over widespread areas, including the central valley floor. Through clearing and settlement the *matorral* has been pushed back to the uncultivated ridges and foothills and greatly thinned by fire and cutting for fuelwood. This woodland is primarily composed of evergreen hardwoods, such as espino (*Acacia cavenia*), boldo (*Boldea boldus*), and peumo (*Cryptocarya rubra*), which is usually only from six and one-half to sixteen and one-half feet tall. In sheltered valleys or canyon bottoms these trees occasionally grow to a greater height. It extends about as far south as the Bío-Bío River, some 300 to 400 miles south of Santiago.

Rainfall Increases in South

Because of increased rainfall timber development continues to increase as one travels south of Bío-Bío. Except for lakes and large natural prairies all of this area at one time was covered by a vast luxuriant forest, which extended from the shores of the Pacific to the cordillera. This forest formed the southern boundary of Chile for some 200 years. Except for settlements such as those of Valdivia and Ancud, neither Spanish nor Chileans could conquer this heavily timbered country, held by the warlike Araucanian tribes until late in the nineteenth century, when the Indians were finally defeated by the Chilean armies fresh from the War of the Pacific. Throughout this southern section as far as Puerto Montt the central valley has been cleared for agriculture. Only remnants of the original forest remain in patches of scattered woodlots and woodlands, but in the coastal cordillera and the main cordillera of the Andes the original forest over large areas remains essentially undisturbed. The trees of this high forest are typically Chilean and include coigüe (*Nothofagus Dombeyi*); tepa (*Laurela serrata*); raulí (*Nothofagus procera*); roble (*Nothofagus obliqua*); laurel (*Laurelia aromatica*); olivillo (*Aextoxicon punctatum*); ulmo (*Eucryphia cordifolia*); lingue (*Persea lingue*); teneo (*Weinmannia trichosperma*); araucaria (*Araucaria imbricata araucana*); luma (*Myreceugenia luma*); alerce (*Fitzroya cupressoides*); mañio (*Podocarpus salignus*); ciprés de las guitecas (*Libocedrus uvifera*); and others.

Usually the forests are dense and the undergrowth luxuriant, with Chilean cane or quila particularly common. Trees range in height from 80 to 115 feet, up to 40 or more inches in diameter, and many have clear lengths of 20 to 65 feet. Although the forest often contains 8 to 12 species, the bulk of merchantable timber is usually found in 2 to 5 species. Some species, such as araucaria and alerce, occur in pure stands to a considerable extent. Ulmo, teneo, coigüe, and tepa constitute 73 percent of the volume of saw timber, with the latter two composing 58 percent. All of the principal species of timber size have commercial value and a number have unusually good timber properties.

To the south of Puerto Montt the character of the country changes materially. The long central valley between the coastal and main cordillera disappears beneath the sea. The coastal range appears as the large island of Chiloé and as a rugged archipelago extending along the coast to Cape Horn. The northern islands of this chain, particularly Chiloé, are still heavily forested as is the mainland, but on the latter the forest is restricted by the rugged character of the country to a broad coastal strip and to extensive areas along the main river valleys. On both islands and mainland the forest becomes lighter toward the south and is interspersed more frequently with scrubby woodland, large areas of grazing land, rocky, snow-clad ridges, and occasional tidal glaciers. At about the Río Baker the saw-timber forest disappears, not to reappear again except in sheltered portions of the Magallanes area, where some commercial timber stands are found.

Forested Area Is Large

The natural forest area of Chile covers approximately 17,000,000 acres, more than one-fourth of which is too steep or exposed to be cut commercially. Of the remaining 13,000,000 acres, 11,000,000 acres are still in virgin condition, 1,000,000 acres are covered by natural second growth or partially cut saw-timber forest, and somewhat more than 1,000,000 acres are in burned and cut-over land which has not been adapted to other uses.

In addition to the natural-forest areas there are approximately 22,000,000 acres of woodland which occur southward on the islands and continent from Puerto Montt. These areas include the dry-zone woodland, which has already been described, and the humid-zone woodland, which frequently appears as patches in the timber forest and subalpine woodland between the saw-timber forest and the upper limits of tree growth. There are also 350,000 acres of planted forests in Chile, about 60 percent of which is insignis or Monterey pine (*Pinus radiata*), 30 percent eucalyptus or bluegum (*Eucalyptus globulus*), 4 percent alamo or poplar (*Populus nigra Italica*), and the remainder various miscellaneous species.

Chilean forests and woodlands contain some 65,000,000,000 cubic feet of sound wood in trees 5 inches in diameter and over, or 175,000,000,000 board feet of lumber in trees over 11 inches in diameter. Most of this volume occurs in the natural-forest area. Sixty percent of the saw timber is north of Puerto Montt and between that city and Temuco in the provinces from Llanquihue to Arauco and Malleco, a region 200 miles long and less than 100 miles wide. Here the natural forest occurs in the coastal and main cordilleras, bordering a central valley through which runs the main railroad system with a considerable number of side laterals reaching up into the mountain sections. Because of the relatively short distance to railheads and the comparable nature of the terrain, the forest area in Chile is no more difficult to operate than timber areas elsewhere in the temperate regions, such as the Appalachian, Rocky, Cascade, or Sierra mountain ranges in the United States.

Cutting shakes, or rough shingles, from alerce (*Fitzroya cupressoides*), the Chilean relative of cypress. This picture was made in the mountains of Southern Chile.

Net Volume per Acre Is High

The net volume per acre in the virgin saw-timber stands of Chile averages about 37,000 board feet (heavier than average virgin hardwood stands in the United States) and the stands from Puerto Montt north are considerably heavier than this, containing about 53,000 board feet per acre. In contrast the virgin saw timber north of Arauco and Malleco and that in Chiloé and Aysen are considerably lighter, averaging some 27,000 board feet per acre.

In general the quality of the timber stand in Chile is good and compares quite favorably with that of the other principal hardwood forests of the temperate zones. Approximately 43 percent of the timber land, particularly that which is south of Puerto Montt, is still in public ownership. The better stands in the north, especially in the more accessible areas, have already passed into private ownership.

The forests south of Puerto Montt, while accessible because of their nearness to water, are light in volume and somewhat poor in composition. Logging operations at the present time are light in this area.

Although Chile's domestic consumption of forest products is comparatively light, the forests already support a relatively large industry. Close to 196,000,000 cubic feet of timber is being cut annually to supply all domestic and industrial needs. Sixty-one percent of this timber comes from the natural forest as against 27 percent from the plantations and 12 percent from the woodlands. In addition to the 196,000,000 feet that is cut from live standing trees, approximately another 38,500,000 cubic feet of wood is salvaged from forest or manufacturing waste. The timber is used primarily for fuel and lumber, although ties, mine timbers, posts, fencing, plywood, pulpwood, and poles consume a considerable amount. Fuelwood depletion is particularly high because of the shortage of other combustibles. Chile has no known oil in commercial quantity, and although its substantial coal resource is the best in South America it is insufficient to supply even the industrial need. Very little is available for domestic use.

At the present time fire takes a heavy toll of Chile's woodlands in certain sections. Fire is said to destroy annually nearly four times the amount of timber that is cut for use. Fire protection and an enhanced public appreciation of the value of these timber resources, therefore, are among Chile's great needs.

As has already been pointed out, the forest plantation occupies a relatively important place in Chile's forestry industry and supplies about one-fourth of the total cut in number of cubic feet. Eucalyptus furnishes about

(Continued on page 234)

South of Puerto Montt the forests are accessible only from the sea.

Hevea Rubber Comes to Honduras

In the effort to produce rubber in the Western Hemisphere Honduras is playing an important part through the establishment of hevea plantings along its northern coast.

by EDWARD T. STANWOOD

During the late summer of 1940 a group of specialists from the U. S. Department of Agriculture visited Honduras with the purpose of surveying the opportunities for establishing a cooperative station which should serve as the center for hevea rubber plantings in that country. The survey revealed that the north coastal plains of Honduras offered the opportunities desired. Soils and climatic conditions seemed excellent for hevea development. The cooperative attitude of the Government of Honduras and private interests indicated that investigational work and stimulation of rubber planting there would have the wholehearted support of these agencies.

Furthermore, in the beautiful Valley of Lancetilla in 1926 the United Fruit Company had established an experiment station and a plant-introduction garden in which economic plants are collected from the far corners of the tropical world for study and experiment. The cooperation of that Company was evidenced in their offer of sufficient lands and the use of established plantings and buildings and in the willingness of the research and other departments to cooperate fully on this new project.

Lancetilla Selected

Lancetilla, accordingly, was selected as the site for the cooperative rubber station. Superior clonal material and local seeds would be distributed to local growers and also to cooperative stations and projects in other countries. The intent was not, however, to disseminate material to independent planters in other countries but to supply only the cooperative stations and projects where technicians could establish and multiply the material for later distribution to planters and areas selected by representatives of both governments. Initial stocks of the high-yielding strains and technical assistance would be furnished for the establishment of plantations in Honduras, and investigations would be undertaken of value to small planters as well as to owners of large plantations. These investigations would concern improvement in propagation methods, field practices, and methods of tapping and of latex processing.

Original clones, received as budded stumps from the Philippine Islands, interplanted with a cover crop. The 6-month growth shown here was cut back and all removable buds grafted into local seedlings for further multiplication of these high-yielding importations.

The early work on rubber by the United Fruit Company was of great advantage to the new project. The first plantings of hevea at Lancetilla had been made in 1926 and 1927. The first planting consisted of 500 seeding trees, the seeds originating from an earlier planting in Costa Rica. These 500 trees have been selectively thinned through the years to a population of 300. They now average more than 75 feet in height and 38 inches in circumference at a height of 3 feet. The second planting consisted of 474 trees from seeds of high-yielding trees growing on the properties of the United States Rubber Plantations Company in Sumatra. These 474 trees have been thinned to a present population of 136 trees, averaging 85 feet in height and 40 inches in circumference at a height of 3 feet. In addition to the Pará rubbertree (*Hevea brasiliensis*), with which this article is principally concerned, other plant introductions of particular value at this time had been made, such as African oil palm, West Indian mahogany,

---

Mr. Stanwood was for some years employed at the Canal Zone Experiment Gardens at Summit, Canal Zone. From August 1940 to September 1943 he was in charge of the U.S.D.A. Rubber Plant Field Station at Lancetilla, Honduras. He then joined the United Fruit Company, from which organization he is now on leave for service in the Armed Forces.

teak, Malayan rosewood, litchi, rambutan, durian, and a host of others.

Much Accomplished

At the time the station was utilized for the cooperative rubber project the hevea trees were in full seed crop. The seeds were immediately used for nursery plantings, and the work has progressed rapidly. Early in 1941 shipments of approximately 4,000 budded stumps of outstanding commercial clones were received from the Philippine Islands. These were multiplied to the extent that during the years 1942-44 there have been distributed 140,423 budded stumps and 16,409 meters of budwood (equivalent to 528,180 usable buds) in excess of local needs. In addition, from the local rubber groves 678,500 seeds, 25,000 seedlings, and 386 pounds of cover-crop seeds were distributed by the Station. These materials have been sent to Honduras, Guatemala, El Salvador, Mexico, Costa Rica, Nicaragua, Panama, Colombia, Ecuador, Peru, Venezuela, and Brazil.

The mature trees were tapped and yield studies undertaken. Two tapping systems have been followed—a half-circumference alternate-day tapping used on the selected seedlings of 136 trees, and the full-spiral fourth-day system used on the unselected seedling planting. The latter system may prove of considerable economic value, especially in those areas where labor scales are higher than average or where a scarcity of labor prevails. The fact has been demonstrated that man-days and costs may be reduced by as much as 30 percent by this system. The yields secured by this method of tapping have also been found to be generally slightly higher than those secured from the half-circumference alternate-day system. Whether or not such a system may prove too severe on the trees has, however, not yet been demonstrated.

Second multiplication of clones received from the Philippine Islands 9 months after budding in local seedling root stocks.

Packing clonal budsticks for distribution to other countries by air express. The cases of budded stumps in the right background are packed for shipment by boat.

The latex has been processed and a total of 6,858 pounds of smoked sheet rubber has been prepared by the cooperator and shipped to the Rubber Development Corporation. An inexpensive smokehouse was constructed, and the practices followed there in the processing of the latex are of so simple a nature that any small planter may follow them with no difficulty and produce a smoked sheet of quality that will compare favorably with that from any other area.

Government representatives and industrial specialists from Liberia, El Salvador, Guatemala, Mexico, Honduras, Nicaragua, Costa Rica, Panama, Colombia, Peru, Venezuela, Haiti, the Philippine Islands, and China have visited Lancetilla for discussions and studies. Several government and commercial representatives have spent periods of residence at the station to become familiar with the recommended practices for budding, packing, tapping, latex processing, and all general field practices. Upon returning to their respective countries or to the interests which employed them, many of these representatives have undertaken positions of importance in establishing hevea-planting projects.

Commercial field plantings of hevea in Honduras now total 626 acres, with an increased acreage planned for this year. The United Fruit Company is the largest planter, having 500 acres, and the remaining 126 acres have been established by 10 smaller planters. Growth and development of these areas point to the suitability of soil and climatic conditions in the north coastal area of Honduras.

In the future the cooperative station will continue to serve as a center for plant multiplication and distribution as well as for local breeding of improved strains. The technical and extension assistance conducted cooperatively with the Ministry of Agriculture, private companies, and individuals should insure continued development of existing plantings and many new ones as the program expands.

Mutual Planning For Progress in Agriculture

Substantial progress was made along lines of cooperative endeavor between leaders of Mexico and of the United States in the second meeting of the Agricultural Commission, held in Washington, D. C., October 9-14, 1944.

by JOHN J. HAGGERTY

The Mexican-United States Agricultural Commission held its second semi-annual meeting in Washington, D. C., during the week of October 9. Attention was concentrated upon further progress in the several lines of work which had been agreed upon in the first meeting of the Commission held at Mexico City in July.*

Pan American Union Host For Opening Session

Through the hospitality of the Pan American Union, the opening session was held in the Governing Board Room of the Pan American Union and a luncheon was served in the Annex.

In opening the meeting, Leslie A. Wheeler, Chairman of the United States Section, expressed the personal regrets of the Hon. Claude R. Wickard, U. S. Secretary of Agriculture, that he had to be absent from Washington during the entire session of the Commission.

A cordial welcome was extended to the Commission on behalf of the Department of Agriculture by Under Secretary Grover B. Hill, who emphasized the importance of agricultural cooperation between Mexico and the United States, and by the Chargé d'Affaires of the Mexican Embassy in Washington, Sr. Rafael de la Colina, who welcomed his distinguished compatriots to this city.

Responding to the welcome, Ing. Alfonso González Gallardo, Mexico's Under Secretary of Agriculture and Chairman of the Mexican Section, outlined the aims of the Commission.

Members of the Mexican-United States Agricultural Commission and other participants in the opening session of the Commission are shown in front of the Pan American Building where the first meeting was held on October 9.

---

* *See* AGRICULTURE IN THE AMERICAS, September 1944.

Dr. E. W. Brandes (left), Chief of Rubber Plant Investigation work for the U. S. Bureau of Plant Industry, shows the group the luxuriant growth of the rubber plants (*Hevea brasiliensis*) which are being developed under artificial tropical conditions at Beltsville.

The Director General of the Pan American Union, Leo S. Rowe, pointed out the significance of the Commission as an example of Pan Americanism at work, and the Assistant Director, Pedro de Alba, who is a native of Mexico, emphasized the philosophical importance of international agricultural cooperation.

In addition to the members of the Commission others who attended the opening meeting as participants or guests included representatives of the Mexican Embassy, Pan American Union, Foreign Economic Administration, and the Departments of Agriculture, Commerce, and State.

Business Sessions Held in Department of Agriculture

In the first business session, on Monday afternoon, the agenda was established providing for committee meetings on Tuesday and Thursday, a full day at Beltsville on Wednesday, and the final sessions on Friday and Saturday. Eight sub-committees were appointed to study during the week preliminary reports on technical problems presented by standing committees which had been appointed at the first meeting of the Commission in Mexico City last July.

The Day at Beltsville

The Mexican members of the Commission and their technical consultants spent Wednesday observing the research highlights at the Beltsville Research Center, under the guidance of E. C. Auchter, Administrator, Agricultural Research Administration, and the heads of the various Bureaus and research projects.

The group first visited the 14,000-acre establishment of the Bureau of Plant Industry, Soils, and Agricultural Engineering. They were shown the open-field plots of the central research project in corn breeding and development and an unusually interesting example of the possibilities of hybridization in the plot of Turkestan sugarcane, *Saccharum spontaneum,* recently introduced from Russia. This hardy perennial, growing as far north as 40° in its native land, is used in this country for crossing with numerous varieties of commercial canes to develop greater hardiness to cold. The resulting increased length of the growing season is of great importance to the sugar producers of Louisiana and Florida.

The extensive greenhouse collections of sugarcane varieties and of tropical rubber trees were of great interest to the Mexican visitors. Both *Hevea brasiliensis* and *H. castilloa,* the latter a native of Mexico, were found to be making good growth.

Special interest was shown in the hog, poultry, and cattle-breeding work of the Bureau of Animal Industry, and in the recently developed family-size white turkey. Turkeys are produced in substantial numbers in the high, dry plateau regions of Mexico, and this smaller, streamlined turkey may hold great promise for such areas.

Another interesting project was the research in animal nutrition. This involves the feeding of rations deficient in vitamin A to breeding bulls of various ages. The blindness and eventual sterility induced by rations deficient in vitamin A were amply demonstrated. This work is significant to livestock producers in zones where stock must be wintered on dry feeds in which the natural vitamin A content tends to be dangerously low.

While only a small fraction of the work carried on at Beltsville could be seen in a 1-day visit, it was sufficient to emphasize the role of scientific research in modern agricultural production and the soundness of the Commission's program to foster cooperation between the scientific men in the two Departments of Agriculture at the level where the technical work is actually carried on.

Progress Seen in Work of Committees

The final sessions of the Commission were taken up by reports of the sub-committees, which had been working during the week, and the decisions of the Commission regarding continuation of the several lines of work. In some instances permanent committees were named to carry on further investigation. The reports by the sub-committees included the following activities:

Exchange of Results of Scientific Research. Lists of research leaders and their projects were adopted and are to be mimeographed in English for distribution to the research workers of the two countries in order that they may communicate directly on research problems in their

---

The author is Principal Agricultural Economist in the Western Hemisphere Division of the Office of Foreign Agricultural Relations and serves as Secretary of the United States Section of the Mexican-United States Agricultural Commission.

common fields. Members of the sub-committee were Chairmen González Gallardo and Wheeler.

Protection and Development of Natural Resources. The survey of existing treaties and conventions between the two countries is to be continued. The sub-committee membership consisted of the two chairmen.

Economic Studies of Special Commodities. Previously prepared special reports regarding prospective United States markets for Mexican coffee, vanilla, onions, garlic, bananas, and pineapples are to be mimeographed for transmittal to the Mexican Section and for limited distribution. More comprehensive reports on the future market situation respecting cattle, henequen, and vegetables, being tentative in character at this stage, were approved for official submittal to the Mexican Section for further study prior to publication. Studies made on ixtle and garbanzos (chickpeas) were found to require further analysis in the United States Section before such transmittal.

One practical outgrowth of the commodity investigations was the creation of a permanent committee to determine the practicability of establishing uniform standards and grades of agricultural products actually or potentially important in trade between the two countries. Special attention is to be directed to bananas and other seasonally important fruits and vegetables. Cattle, meats, and hard fibers, particularly henequen and ixtle, will also receive attention. Members of the sub-committee were Ing. Gonzalo González, Ing. Luis Mas, Lester D. Mallory, U. S. Agricultural Attaché, Mexico, and Joseph Becker of the Office of Foreign Agricultural Relations.

Mexico's Under Secretary of Agriculture, Ing. González Gallardo, and Dr. Quesada Bravo, Chief of Mexico's Bureau of Animal Industry, evidence keen interest in the family-size, streamlined white turkey.

Outstanding varieties of sugarcane have been collected from all producing regions of the world and are being scientifically studied, tested, and propagated in Louisiana, Florida, and at the Beltsville Research Center. Samples of this collection have been made available to Mexico and are being grown in the State of Veracruz.

Plant and Animal Quarantines, Seed and Livestock Certification, and Related Problems. Among the definite possibilities for action in the field of plant and animal quarantines, measures are contemplated to assure foreign purchasers of United States seeds substantially the same safeguards as to purity, germination, etc., as are now available to domestic purchasers under United States laws, and to assure the validity of certification of pedigree of livestock for breeding purposes. Definite plans were initiated by which the control agencies of the two countries can be promptly marshaled for effective work in the event of an outbreak of foot-and-mouth disease or other serious epidemic in the agriculture of either country. Members of the sub-committee were Dr. G. Quesada Bravo and Ing. Dario L. Arrieta for Mexico, and for the United States, E. C. Auchter; P. N. Annand, Chief, Bureau of Entomology and Plant Quarantine; A. W. Miller, Chief, Bureau of Animal Industry; S. O. Fladness, Chief, Field Inspection Division, B. A. I.; C. W. Kitchen, Deputy Director, Office of Distribution. Members of the permanent committee are Ing. Fernando Brom, Chief, Section of Seed Testing and Exchange of Plant Materials; Ing. Ricardo Coronado, Chief, Office of Quarantine; Dr. Horacio Polo, Chief, Office of Zootechnology; and Messrs. Annand, Kitchen, and Miller.

Living Conditions in Rural Areas. A permanent committee was authorized to make preliminary studies of living conditions in rural areas of acute distress and to recommend measures looking toward their improvement. Members of the sub-committee were Ing. Arrieta and Ing. Ramon Fernández y Fernández for Mexico, and, for the United States, Carl N. Gibbony, Chief, Food Production

(Continued on page 235)

Brazil's new National Agricultural Center of Education and Research is located in a beautiful valley. Nearby mountain peaks make an imposing setting for the Center. These buildings are the first of an extensive building program.

"Kilometer 47"

The value of education and research in the field of agriculture is widely recognized. With the development of its new National Center, Brazil is taking an important step in that direction.

by GUY L. BUSH

A colossal plan for agricultural education undertaken by the Brazilian Government is now reaching the point of reality in Brazil. The National Agricultural Center of Education and Research is scheduled to be inaugurated early in 1945. The Center is commonly known as "Kilometer 47" because of its distance from Rio de Janeiro, where it is located in a beautiful valley surrounded by mountains typical of central Brazil.

Not only is it to be Brazil's largest agricultural experiment station, but combined with the field experiments and research laboratories will be an agricultural college, a boys' training school, and a multitude of special educational projects, under the general direction of Professor Heitor Grillo. The enrollment of the college will have a running start over the others, for the new Center is to assimilate the student bodies and equipment of the National School of Agronomy and the National School of Veterinary Medicine, which have been scattered over the city of Rio de Janeiro, removed from the environment of agriculture. Existing research laboratories, such as the Institute of Ecology and Agricultural Experimentation, the Institute of Agricultural Chemistry, the National Institute of Oils, and the Institute of Fermentation, will also move to "Kilometer 47" and become units of the Center.

The Agricultural Institute at "Kilometer 47" will be coordinated with the various Federal Agricultural Institutes which conduct a network of experiment stations in the four regions of Brazil, and they will all be placed under the direction of Dr. Alvaro Barcelos Fagundes. With the inauguration of this new Institute, Brazil will have 36 Federal agricultural stations and 44 State stations, and 3 more Federal stations are in either the blueprint or the constructional stage. These stations vary from 100 to 7,500 acres, with buildings and equipment in proportion to their size, and with activities ranging from seed multiplication through all the work of full-fledged experimental stations.

Started Six Years Ago

"Kilometer 47" has been under development for 6 years. Its inception is credited to the present Brazilian Administration's interest in agriculture, and its completion can be attributed to the present Minister of Agriculture, Apolônio Salles, who has taken a keen and directive interest in its success.

As land is cleared experimental plots are planted, and as buildings are completed laboratories are put into operation. Of the 10,750 acres set aside for the plant, 310 acres are now in experimental plantings of fruits, grains, fibrous plants, oil-bearing plants and trees, and forestry projects. Laboratories that are already operating include those of the Institute of Ecology and Agricultural Experimentation, and the departments of silk culture, poultry, apiculture, farm mechanics, meteorology, and biology.

As its first undertaking, the Institute of Ecology and Agricultural Experimentation is concentrating upon a thorough study of the station's possibilities. Soils are being analyzed and rainfall and temperatures recorded so that the maximum of related information will be available to interpret properly the results of the various field tests.

Several Projects Under Way

The horticulture, agronomy, and apiculture sections are on an operating basis. In the horticulture section first-test plots of oranges, avocados, and mangoes are now 5 years old. Present plantings include 488 varieties of fruits and nuts, of which many are native to Brazil, such as the cashew, pineapple, papaya, and numerous fruit-bearing palms. Test plots in the agronomy section include most of the grains and tuber plants with which the Western Hemisphere is familiar. The apiary has the popular domestic and foreign strains of bees under observation and its laboratory, although not fully equipped, is operating. Recently it received four queen bees, which had been selected by Minister Salles and carefully nurtured by him, on his return from his visit to the United States. The records of the various departments are kept in their own laboratories.

Of the group already in operation, the culture of silk is the most advanced. The laboratory and the experimental plants of mulberry trees, natural food of the silkworm, are adjacent. The main building houses testing and weaving equipment and a refrigeration plant used in the propagation of the silkworm. In the experimental plot are a number of varieties of mulberry trees from which strains are being selected for propagation. In the process of reproduction, the silk boll must go through a period of comparatively low temperatures. The major silk-producing countries depend upon seasonally low temperatures for reproducing the silkworm. Since the mulberry tree's growth is dependent upon the same climatic changes, the annual production is limited to two crops. In central Brazil the temperature is favorable to the continuous growth of the mulberry tree but not low enough to reproduce the silkworm. In experiments, as many as four crops of silkworms have been produced in 1 year through refrigeration, proving the feasibility of continuous production. With this evidence, the selection of strains of mulberry trees for continuous growth and desirable foliage becomes of prime importance. Several varieties already show great promise.

Dr. Apolônio Salles, Brazil's progressive Minister of Agriculture.

The author was for several years associate editor of *Wallace's Farmer*. In 1934 he joined the Agricultural Adjustment Administration as information specialist on the Corn Belt. At present he is Agricultural Attaché at Rio de Janeiro.

In the poultry pens can be found the best-known breeds of the United States and Europe, with White Leghorn, Rhode Island Red, and Sussex predominating. Egg-laying records are being kept and matings are being made between the most productive and adaptable strains. Various incubation, brooding, and feeding systems are under observation, as well as feed mixtures, the contents of which in some cases are products peculiar to Brazil.

For the animal husbandry division the central building and the horse barns are completed, but buildings for the dairy, beef, and swine sections are yet to be built. Housing for the veterinary section is also incomplete. That department will continue operating in Rio de Janeiro until facilities are available at the Center.

Student Training Important

In the long run, the students will influence more deeply than anything else the successful application of the results of the experiments made at the station. Under the direction of Professor Waldemar Raythe, the curriculum is being planned to require students to earn a portion of their credits through conducting experiments in the field or in one of the laboratories of their chosen field. The system is already functioning in the farm-machinery section. Students from the National School of Agronomy, which continues to function in Rio de Janeiro until classes are opened at "Kilometer 47", travel the 29 miles to the National Center weekly to learn the use of all types of farm machinery by actually repairing and operating the equipment in the farm-machinery section, which is already operating.

Buildings are being completed to accommodate 1,200 students. The most impressive is the Central Building, with its patio covering about two and half acres. Others of the classroom groups are nearing completion. Within easy walking distance from these are the dormitories. The first unit is now nearly ready to house 450 students.

Of special interest is a boys' training center, the first unit of which has been in operation for 11 months. The building contains a dormitory and classrooms to accommodate 378 boys. The project will eventually include 1,200 boys, selected from Brazil's 20 States and 7 Territories. When the members of the student body were chosen 11 months ago, their ages ranged from 10 to 14 years. The subjects taught are similar to those in the final grades and high school courses in the United States except that all subjects embody agriculture wherever possible.

Yet to be organized are the special projects, which include activities ranging from educational and training courses for farmers to postgraduate courses. The development of "Kilometer 47" is a source of great satisfaction to those interested in the advancement of agriculture in Brazil.

THE FOREST RESOURCES OF CHILE

(Continued from page 226)

24,000,000 cubic feet annually for fuel, in addition to mine timbers and other products. Insignis pine also is important as a source of lumber, box board, and pulpwood. In contrast to the natural forest, where no forestry practices are carried on, the plantation area is intensively managed. In some plantations, such as the alamo, which is grown primarily for match stock, thinning is started as early as 2 to 4 years and continued throughout a 20-year rotation. Insignis pine is ready for thinning at 10 to 12 years, while harvest cutting is planned on a 20- to 25-year rotation. Eucalyptus is often managed for a fuelwood rotation of 10 or 12 years.

One of the most interesting systems of plantation management is the eucalyptus grown for mine timbers, under which cuttings are made at approximately 15-year intervals over a 60-year rotation. The sprouts resulting from each cutting are carefully thinned back so that from one to three

Central Building, which houses laboratories and classrooms. With its patio this building covers about 2½ acres. Buildings are being completed to accommodate 1,200 students who will come from Brazil's 20 States and 7 Territories.

remain on each stump or stool. These are permitted to grow to mine-timber size.

Both eucalyptus and insignis pine reseed naturally, and undoubtedly much of the forest land now planted will be reseeded naturally in the future. Annual production of planting stock is roughly estimated at 35,000,000 trees. Assuming 75 percent survival, this would be sufficient to plant about 24,000 acres annually. At the present rate the expectation is that within 20 years the plantation system alone will furnish about 196,000,000 cubic feet of timber annually or the equivalent of the present total annual cut.

A crude logging railroad in Chile. Oxen still furnish the main means of transportation of logs in some sections. Note logged-over forest land in background.

The forest situation in Chile is an optimistic one insofar as the character and quantity of the resource itself are concerned. The forest industry can be enlarged several times and maintained on a permanent basis if simple forestry practices, primarily fire protection, are introduced into the management of the natural-forest area. Chile's per capita consumption of timber is now rather low in comparison with the substantial forest resource. The probabilities are, however, that in the future domestic consumption may be expected to rise and perhaps some export of forest products undertaken, thus making Chile's forest resource an even more important element in the country's economy.

NAMES AND NEWS

(Continued from inside front cover)

Brazilian Studies Extension Methods

***Senhor Joaquin Moreira de Mello,* Director of the Paraíba School of Agronomy in Brazil, is visiting the United States this winter as a guest of the Institute of Inter-American Affairs. While here he will make a study of Extension Service methods under the Department of Agriculture.**

MUTUAL PLANNING

(Continued from page 231)

and Procurement Division, Foreign Economic Administration; Dr. Louise Stanley, Assistant to the Research Administrator, Agricultural Research Administration; Fred P. Frutchey, Senior Analyst, Division of Field Studies and Training, Extension Service; Jesse Gilmer, Assistant Administrator, Farm Security Administration; Douglas Ensminger, Social Scientist, Division of Farm Population and Rural Welfare, Bureau of Agricultural Economics.

Training Agricultural Scientists and Technicians. A permanent committee was established as the nucleus for national councils in both countries to supervise the interchange and training of agricultural specialists and graduate students. Members of the sub-committee were Dr. Quesada Bravo, Ross E. Moore, and Lester D. Mallory.

Crop and Livestock Estimates and Related Agricultural Statistics. Recognizing the importance of accurate crop and livestock statistics, the Commission designated a permanent joint committee to survey existing methods of obtaining, processing, and publicizing statistics in the two countries with a view to increasing their accuracy, usefulness, and uniformity. Emphasis was placed upon the importance of a periodic agricultural census. Members of the sub-committee were Ing. Gonzalo González and Ing. Luis Mas for Mexico, Irvin Holmes of the Census Bureau, and Joseph A. Becker, of the Office of Foreign Agricultural Relations.

A report on the Mexican labor recruitment program of the United States made by Brig. Gen. Philip G. Bruton, and C. E. Herdt, of the Office of Labor, indicated the likelihood of a continuation of the program into another year and showed that repatriation is a continual process, since large percentage of the Mexican workers return to their homes after their initial 6-month contract.

New Business

Two new projects were adopted. One calls for a joint study of cotton, looking to increasing the quality and efficiency of production.

The second involves arrangements for representatives of the Mexican Chamber of Forestry and a representative of the Mexican Government Forest Service to visit the United States. This mission will lay the ground work for a joint research undertaking in the field of forestry.

Future Meetings

Tentative plans were made for the next meeting of the Commission at Guadalajara, Mexico, in May 1945. The aim of the Commission is to act more and more as a board of review on the work done by permanent technical committees.

ALONG THE *Agricultural Front*

▲ "Colombia" Threshing Machine Makes Debut

A Bogotá newspaper recently carried an announcement of the successful production of the first grain-threshing machines manufactured in Colombia. The manufacturing firm is Unión Industrial, a Colombian shipbuilding and machinery firm located at Barranquilla.

One of the most interesting features of these threshing machines is what is called the *zarandas* or screens. There are 30,000 holes of .2, .12, and .16 inches in the screens, permitting various types of threshing, with a production of 30,000 pounds of certain grains in 8 hours of work.

The raw materials, including steel and iron, used in making these machines are said to be Colombian. The low cost of the threshers and the fact that they can be used under any conditions are said to make them ideal for the Colombian farmer. They have been so well received all over the country that mass production is being undertaken. They are also reported to be in use in Venezuela as well as Colombia.

▲ El Salvador's Credit Cooperatives Growing

The Federation of Credit Cooperatives in El Salvador is taking an active part in the development of handicraft industries in rural areas, and in the propagation of better agricultural practices among its members.

At the end of the fiscal year on May 31, 1944, the Federation showed marked growth during the year. The number of independent member associations had increased from 31 to 43 and total assets of the Federation had almost doubled. Government assistance to the Federation will take the form of annual financial grants over a 12-year period to establish a special fund, a system similar to the annual allotments made to the Mortgage Bank, from an export tax on coffee, to build up a reserve or "guarantee" fund.

▲ Brazil Plans Extensive Road Building

A National Road Plan for an elaborate system of highways throughout Brazil has been approved by government decree, and studies to determine exact routes for the various highways are being undertaken.

The principal grand-trunk road in this network will be the Getulio Vargas highway which will follow roughly the littoral region from Belém on the Amazon to Jaguarano in the extreme south, uniting Belém with the northern State capitals and passing through Rio de Janeiro, São Paulo, and many other places. Another highway, the Pan-Northeastern, will join all the capitals of the northeastern States. The Transnordestina, the construction of which is already far advanced, will establish direct communication between the capitals of the States of Ceará and Baía. The Transbrasiliana highway will establish through the central part of the country direct connection between Belém in the State of Pará and Santana do Livramento in the State of Rio Grande do Sul, and will reach extreme points which have heretofore been too remote for close communication. The Amazonian highway starts from Santarém, half way between Belém and Manáus, and runs to the center and south of Brazil, cutting through undeveloped territories in the State of Mato Grosso. Finally, the Acre highway will unite the Acre territory to the center and south of the country.

At the same time a 4-year plan of railroad development which is to be accomplished between 1944 and 1947 is another important project in transportation, involving an expense of approximately $33,000,000. The immediate part of this program includes a continuation in the building of more than 500 miles of single-track roadbed to link the railway service of Brazil's northern city of Natal, in the State of Rio Grande do Norte, and the southernmost States of Santa Catarina and Rio Grande do Sul. This is an important development for Brazil.

▲ Chilean Onion Producers Organize

At a meeting held July 7 under the auspices of the Chilean *Sociedad Nacional de Agricultura* an Association of Onion Producers was proposed, and committees were appointed to undertake the actual organization. The Association is to be divided into two sections, one covering the provinces of Valparaiso and Aconcagua and those north, the other covering the province of Santiago and the provinces to the south. Determination is being made as accurately as possible of the amount of land which is at the present time under onion cultivation, and an agreement is sought with the Exporters Association for the payment of a minimum price which may result in an adequate profit to the producers. Possibilities for the exportation of onions are also under discussion.

▲ Brazil Produces Quantities of Salt

Brazil has 933 salt plants with an approximate area of nearly 5,000 acres. These plants produced in the past year 694,121 tons of salt, an increase of about 296,000 tons over the preceding year. The salt produced there is considered among the best in the world, containing from 96 to 98 percent sodium chloride (common salt).

At present, because of high freight rates and other difficulties with transportation to market, consumption of salt in Brazil is less than production, but with the development of transportation facilities the obstacles which impede the normal supply from the production zones will be removed. A National Salt Institute has been created to expand the program for the treatment of salt.

▲ Chile Has New School For Fishermen

A training school for fishermen will be established at Mehuin, on the Pacific coast north of Valdivia, Chile. In line with the Chilean Government's efforts to increase interest in the fishing industry—efforts which have been encouraged by a visiting group of United States experts in fishing and its problems—the school will provide a local training ground in the building and maintenance of boats, economical ways of fishing, and profitable distribution and sale of fish.

▲ Substitute For Balsa Found in Central America

From Panama has come a sample shipment of quipo wood, also called "bongo," which the Forest Service of the U. S. Department of Agriculture believes may be used interchangeably with balsa. The lightness of balsa has made it highly important as core material in "sandwich" construction of plywood for aircraft and other war uses. The quipo wood does not have the silky luster of balsa, but it is as light, and its specific gravity is more uniform than is the rule with balsa. This would be an advantage where material with uniform weight and strength is required.

The quipo tree, the botanical name of which is *Cavanillesia plantifolia,* is found principally in Central America. The tree grows more slowly than balsa, not coming to useful size until it is about 30 years old, while balsa grows quickly and is used after 4 to 6 years.

▲ Coffee to Give Oil For Your Automobile

A Swedish inventor is said to have devised a method of extracting large quantities of products from coffee—not only caffeine, fat, and tannin, but also lubricating oils and different kinds of phenol and hydrogen.

After the caffeine has been extracted, the ground coffee is mixed with calcium protoxide and small quantities of two catalysts. The mixture is heated in an oven at about 500 degrees, and the resulting gas passes through a series of condensers, the different materials becoming separated one after another by means of distillation and decantation. The inventor has found that the following products can be obtained from 5,070 pounds of unroasted coffee: In the first stage of the process—53 pounds of caffeine, 529 pounds of fat, and 88 pounds of tannin; during the second stage—227 pounds of acetone, 97 pounds of methyl alcohol, 53 pounds of phenol, 368 pounds of raw oil, 672 pounds of lubricating oil and ammonia, and 520 to 650 cubic yards of hydrogen gas.

The oil extracts vary from the lightest to the heaviest qualities. They are raw oils which are said to be suitable for use in motor cars or airplanes. Some of them have a fuel value of more than 10,000 calories. Since the hydrogen gas obtained supplies the necessary vapor for the process, the total costs of production are small.

▲ "Insect Trapper" Fungus Discovered

A fungus that traps and destroys certain insects has been discovered by a pathologist in the Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture. It is a microscopic soil-inhabiting fungus, said to be "unmistakably adapted to prey primarily on insects."

More than 60 fungi are known to capture animal organisms, such as amoebas, nematodes (parasites such as the pinworm, trichina, and Guinea worm), rotifers (minute aquatic animals), and other small forms, but the new one, called by the discoverer *Arthrobotrys entomopaga,* (the second part meaning "insect trapper") catches springtails, insects that jump by means of springy near-end spines. The springtails are found frequently on decaying vegetable matter and are known sometimes to attack economic plants in the growing stage. Thus, these "trapper" fungi may be a factor in protecting plants against parasites.

The recently discovered fungus sends out horizontal threads or hyphae that crisscross and make a network which may be likened to a piece of electrically welded wire fencing in miniature. This network sends up columns that exude at the tops droplets of a clear adhesive liquid, the death trap for the springtails. When they have been caught in the adhesive liquid, the insects are run through with a cobweb of filaments that transfer the food elements from their bodies to the fungus.

The discoverer suspects that other fungi likewise preying on minute insects may inhabit porous decaying materials.

THE MAGDALENA RIVER

(Continued from back cover page)

Bogotá, and Manizales. Most of the industries are for the production of consumer goods — textiles, tobacco, flour, sugar, and other foods. The principal producing area of all commercially important minerals, with the exception of platinum, is in the Magdalena River Basin. Petroleum, Colombia's second most important export, is found in the vicinity of Barrancabermejo, about 350 miles up the Magdalena River; gold is produced principally in the Western and Central Cordilleras and along the rivers that drain these regions; and emerald production is concentrated in the "Muzo" mines about 60 miles northwest of Bogotá.

Agriculture

The agriculture of the basin is the agriculture of Colombia. Products range all the way from the bananas, coconuts, and other tropical products on the coastal lowlands to coffee and cacao in the subtropical climate on the lower mountain slopes, and to wheat and barley on the cool highland *sabanas* around Bogotá. Colombia's commercial agriculture is centered around one crop—coffee—produced on the slopes of the three Andean ranges. The most important producing areas are on both sides of the Central and on the west side of the Eastern Cordilleras. Colombia is the second-largest coffee exporter and is the leading world producer of the mild type. Most of the coffee is produced for export, the domestic consumption in 1940 being only 400,000 bags out of a total production of more than 4.5 million bags. Until early 1942, bananas from the Santa Marta area in the lower Magdalena Valley were important in the agricultural trade of Colombia, ranking as the second agricultural export (in terms of value).

Principal food staples include corn, rice, beans, yuca, and potatoes. The basin produces enough corn and beans for its people, but in prewar years imports provided a large part of the fats and oils, wheat, and cacao. Extra efforts have been made by the Government to increase production of these items, with substantial results. Imports are still needed, however, of wheat, cacao, and fats and oils. Cotton, tobacco, fique, and pita fiber, all grown for domestic industry, are produced largely within the Magdalena River Basin.

Cattle make up a good part of the wealth of Colombia. Although cattle are raised in all parts of the country, almost one-fourth of the total number are in the Department of Bolívar in the lower Magdalena Valley, with large numbers in the Cauca Valley and on the Sabana de Bogotá.

In spite of present and prospective shifts from the river boats to freight cars and airplanes, the Magdalena River Basin probably will continue to be the heart of Colombia's economic life for many years to come. It is there that the people live, the industries are established, the mines are operating, and the agriculture is most highly developed.

Brazil on the March, by Morris Llewellyn Cooke. 303 pp., illus. Whittlesey House, New York; 1944. In 1942 the American Technical Mission went to Brazil to aid that country in solving economic problems caused by the cutting off of foreign trade by the submarine menace. The chairman of the Commission has written in *Brazil on the March* an account of Brazil's metal and mineral resources, agriculture, transportation, electricity, and future manufacturing possibilities. A chapter entitled "Etiquette for American Investors" is included. The book is "a study in international cooperation."

Inter-American Education, by Effie G. Bathurst and Helen K. Mackintosh. 66 pp., illus. Bulletin 1943, No. 2, U. S. Government Printing Office, Washington, D. C. (Price 25 cents). This is a curriculum guide prepared by the Inter-American Demonstration Center project of the U. S. Office of Education. It contains: Definite information as to the content of learning at primary, intermediate, junior and senior high school, and teachers college levels; suggestions for organization of experiences in the development of curriculum units and for introducing inter-American studies into the present curriculum; aids to teaching and learning, including an extensive bibliography.

A noz do Brasil (*Castanha do Pará*), by Hannibal Porto. 19 pp., illus. Serviço de Informação Agrícola, Ministério da Agricultura, Rio de Janeiro, Brasil; 1943. A bulletin, in Portuguese, on the Brazil nut.

Brazilian Portuguese From Thought to Word, by Frederick B. Agard, R. W. Willis, Jr., and Hélio Lobo. 277 pp. Princeton University Press, Princeton, New Jersey; 1944. This is a grammar of the Portuguese language, using the same instructional method as that of Willis and Agard's *Spanish From Thought to Word.* The approach is through the medium of ideas in typical patterns of the known language to the corresponding patterns in the language to be learned. In addition to analysis, illustrative material, exercises, and guide to pronunciation, the book includes an English-Portuguese, Portuguese-English vocabulary selected from such fields as commerce, travel, military affairs, and aviation. The new official Brazilian spelling is used.

Latin America and the World Struggle For Freedom, by Ryland W. Crary. 120 pp., illus. Ginn and Company, New York; 1943. This is one of the unit studies in American problems prepared for the Committee on Experimental Units of the North Central Association of Colleges and Secondary Schools. It is designed as a guide and working outline for a study of Latin America, covering such phases as historical development of the various republics, geographical setting, nations and peoples, agricultural life and problems, cultural trends and social problems, relations with the United States, and the part of Latin America in the world struggle for freedom. Lists of readings, study aids, projects and problems for discussion are included.

As abelhas, a colmeia e os exames. 13 pp., illus. Instituto de Biologia Animal, Rio de Janeiro, Brasil; 1943. A bulletin, in Portuguese, on bees and bee-keeping, for the use of children in primary school.

La crisis de la ganadería; algunas medidas para el fomento pecuario nacional, by Agr. Ing. Carlos F. Martínez Claure. 20 pp. Ministerio de Agricultura; Dirección de Agricultura. La Sección Técnica de Propaganda Agropecuaria (Technical Section of Crop and Livestock Information), Lima, Peru; 1943. The author discusses, in Spanish, the action which the Peruvian Government has taken in regard to the livestock crisis, the causes of the crisis, and some measures to develop the livestock of Peru.

Les ennemis de la fortê. 20 pp., illus. Ministère des Terres & Forêts, Service de la Protection, Québec; 1943. A discussion, in French, of the enemies of the forest—fires, insects, and diseases.

Brasil e suas riquezas, by Waldemiro Potsch. 392 pp., illus. (colored plates). Alves, Rio de Janeiro; 1943. This is a primary school text book, in Portuguese, on the national resources of Brazil, designed to make the children who study it proud of being Brazilians. It should be equally good for grownups who wish to gain a general idea of the country's wealth.

Los problemas económicos de Cuba en la post-guerra, by Gerardo Portela. 38 pp. Universidad de la Habana; 1943. The author deals with post-war problems of Cuba as they affect trade, money, banks, shipping, and financial recovery.

EDITOR'S NOTE.—The listing of publications here does not necessarily imply an endorsement of them by the Department. For copies of private publications, write direct to the publishing agency given in each case.

AGRICULTURE IN THE AMERICAS O. R. CARRINGTON, EDITOR

A monthly publication of the Office of Foreign Agricultural Relations of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 10 cents per copy, or by subscription at rate of 75 cents per year, domestic; $1.20 per year, foreign. Postage stamps will not be accepted in payment.

Gifts of the Americas

CARNAUBA WAX

by BEATRICE DU FRANE

Aptly named the "Tree of Life" by Humboldt, the famous nineteenth century naturalist, the carnauba palm is the source of the world's most valuable vegetable wax—carnauba wax—listed among Brazil's exports for more than a century. Although native to most of the country, only in the semi-arid Northeast Area of Brazil does the tree produce extractable quantities of wax. From this region comes the world's entire supply.

The uses of carnauba wax are many. Picric acid for gunpowder, lipstick for milady, sealing material for dry-cell batteries—into all of these goes carnauba wax. It is used in the manufacture of floor, shoe, and furniture polishes, phonograph records, sound film, electric insulators, soap, candles, lubricating oils, and carbon paper. Wrapping paper, cardboard, textiles, and industrial machinery are waterproofed with it. Carnauba wax goes into various salves and ointments, artificial fruit, plasters, matches, cable coverings, paints, and varnishes. A coating of the wax enables airplanes to increase their speed. Having three times the viscosity of beeswax, it is used to harden beeswax, ceresin, and paraffin.

The value of the carnauba palm, however, is not limited to wax. To Brazilians it is indeed the "Tree of Life." The trunk provides rural housing materials, furniture, pilings, fences, bridges, and fuel for industrial use. The bark is used for home fuel. From the leaves are made baskets, thatch roofs, hats, ropes, mats, and other woven products. The sap provides a wholesome tapioca and a fermented drink. Young shoots are used as the palmito cabbage, and the heart of the young palm provides a starch, similar to manioc flour. From the pith comes a coffee-like drink. Stalks and other residue provide cattle fodder.

This versatile palm derives its name from the Tupi Indian words *carana* meaning scaly, thick-skinned, and *yba* meaning palm. Literally translated, the Tupi words mean "The tree that scratches." Classified botanically as *Copernicia cerifera*, the palm thrives in broad, dry valleys and along river banks, the largest stands being in the States of Ceará and Piauhi. The carnauba palm is a slender, majestic, slow-growing tree, averaging 25 to 35 feet in height. The bark is rough, thick, and scaly; the flowers numerous and tiny; the fruit, growing in bunches, is green until ripe, when it becomes rust colored. Carnauba wax comes from the serried, fanlike leaves, radiating from the crown of the tree. Giving the appearance of a coating of dust, the wax forms during the dry season, preventing excessive water evaporation from the tree. Drought increases the yield of wax, but severe drought over a period of several years may kill the tree. Young trees begin to produce wax after 8 or 10 years.

The wax harvest comes largely from wild trees. Harvest operations are carried on by primitive methods during the dry season, from September to December. The work is done by hired laborers, tenant farmers, or by *moradores*, semi-nomadic cattle raisers who move about in search of pasturage. Two cuttings are made each season, with a lapse of about 80 days between cuttings. With a knife attached to a long stick and curved like a sickle, the worker cuts the stems and collects the leaves as they fall to the ground. Care must be exercised in selecting leaves to be harvested. If very young leaves are cut the tree will slowly die; if fully matured leaves are cut they yield little wax. Selection is based on the position of the leaves on the tree. Young leaves grow upright, and then of their own weight bend outward and downward as they mature. Leaves pointing to the rising or setting sun, in what the natives call the "6 o'clock" position, are old.

Cut leaves are sun-dried for three to five days, during which their wax coating becomes a flour-like dust. Drying is done either in open fields where the wind causes a dust loss of 20 to 30 percent, or in walled enclosures which permit exposure to the sun while affording protection from the wind. In a windproof shed the dried leaves are beaten to liberate the dust, which is placed in clay vessels and melted down into wax, or mixed with a small quantity of water and boiled. When dissolved, the wax is strained through a coarse cloth or wooden press to remove some of the impurities, and then allowed to cool. The solidified mass is broken into small pieces and packed in bags. Wax obtained from new leaves is of the greatest commercial value. Older leaves yield a darker, less-valuable wax.

On the backs of small donkeys, natives transport the wax to shipping centers where it is repacked in burlap bags for export. About 70 percent of the annual harvest goes to the United States.

Carnauba wax, Brazil's gift not only to the Americas but to the world, is one of that country's major exports, and a product whose usefulness for some purposes has no substitute.

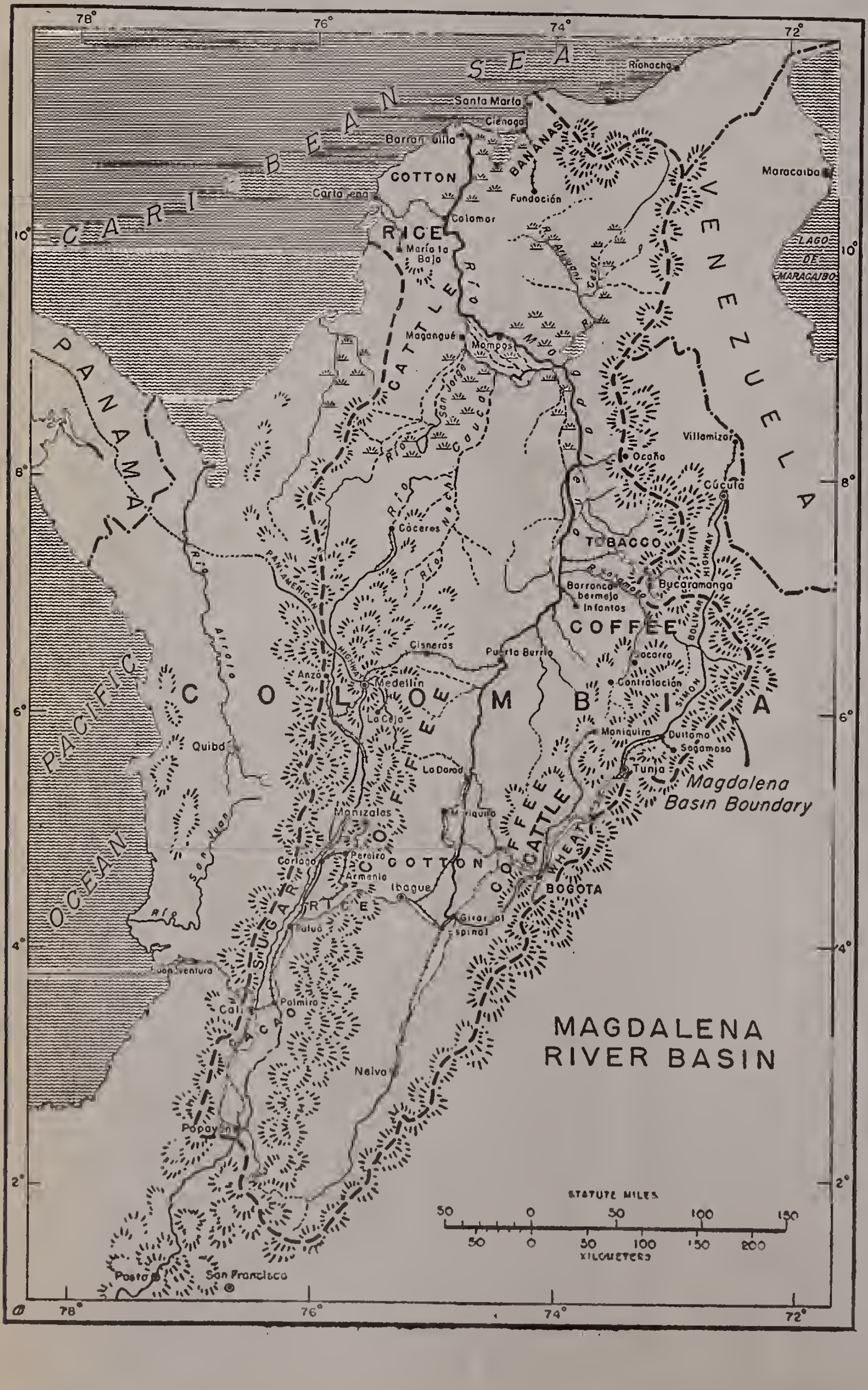
THE MAGDALENA RIVER BASIN—COLOMBIA

by Kathryn H. Wylie

Ever since Quesada marched his small band of conquistadores from the sea up through the mountains in search of the source of the Magdalena, that great river has shaped Colombia's economy. The river basin, which is entirely contained within the one country, includes most of the highlands, where the population and economic activity are concentrated, as well as the Caribbean coastal lowlands. The river with its 500 tributaries affords about 2,500 miles of more or less navigable waterways.

The Magdalena rises far to the south and flows between the Central and the Eastern Cordilleras of the Andes almost a thousand miles to the sea; its principal tributary, the Cauca, flowing between the central and the western arms of the mountains, parallels the Magdalena for three-quarters of its length. Just south of the confluence of these two streams, the Magdalena is joined by the César River, which drains part of the Sierra Nevada de Santa Marta range. The northern part of the river is broad and strong, a mile wide at high water. Although it is even today the main artery of commerce, the river is sometimes an inconvenience as well as a blessing. In the dry season from December to April, its mouth is a swampy delta where only small boats can navigate, and farther south it is shallow and bar-clogged. Even in the wet season, traffic moving south up the river must be transferred to a railway at La Dorada to go around the rapids and be reloaded on small river steamers to continue the journey on the river. The trip from the Caribbean to Bogotá, the capital, by rail and river requires five or six transfers and a minimum of 7½ days' travel, which stretches out to many weeks in the dry season.

With the exception of the port of Buenaventura on the Pacific Ocean, little settlement or economic development extends beyond the area touched by the river's influence. The lofty Andean ranges, which circle the basin on three sides, have hampered communication with the vast eastern llano and selva regions and channeled commerce north and south. With the recent development of rail communications between Buenaventura and the highlands, more and more freight traffic is moving west. Already rapid and efficient air service from the Caribbean to Medellín and Bogotá is taking the passenger trade from the river. When the war is over, air freight service may revolutionize the transportation system.



Industry and Mining

Colombia is not an industrial nation, but the industries it does have are practically all in the highlands, particularly in the cities of Medellín,

(Continued on page 237)

☆U. S. Government Printing Office: 1944—616347

152A
f5

UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF FOREIGN AGRICULTURAL RELATIONS

Agriculture in the Americas

INDEX TO VOLUME IV—1944

MAR 14 1945
U.S. DEPARTMENT OF AGRICULTURE

MAIN ARTICLES AND THEIR AUTHORS

JANUARY— Page

Agriculture Across the Andes-------*E. C. Higbee* 3
Abacá—A New Crop for Latin America *Harry T. Edwards* 8
Wildlife Management in the Americas *Frederick C. Lincoln* 13

FEBRUARY—

Extension Work at Tingo María-*Charles P. Loomis* 23
Soft Fiber From Roselle----------*Julian C. Crane* 27
Agricultural Museum in Peru----*Carlos F. Vivanco* 30
Dairying in Nicaragua--------------*A. C. Dahlberg* 33
Gifts of the Americas—The Pineapple *Truman Nold* 39

MARCH—

Pearl Harbor Sent Quinine Home *William C. Davis* 43
Sheep of the Andes------------*Elizabeth P. Tappy* 46
Rural Reconstruction in Mexico--*D. Spencer Hatch* 51
Hacienda Pichilingue--------------*Lewis E. Long* 54
Gifts of the Americas—Kapok---*Charles H. Barber* 59

APRIL—

Paraguay Improves Its Agriculture---*E. C. Johnson* 63
Flowers That Fight Malaria--*Raymond E. Culbertson* 66
Henequen From Cuba--------------*Allen H. Lester* 69
Dairy Cattle of Colombia----------*R. E. Hodgson* 73
Gifts of the Americas—The Cashew *Hally H. Conrad* 79

MAY—

Lagunas—Barbasco Capital of the World *E. C. Higbee* 83
Can We Have the Right Food?------*Louise Stanley* 87
Collaborators in Soil Conservation--*William X. Hull* 91
Potato Improvement in Peru--------------------- 94
Gifts of the Americas—The Guava----*Fred A. Motz* 99

JUNE—

Mexico's Cattle Industry-------*Esther H. Johnson* 103
Toward Practical Cooperation-----*Carl F. Taeusch* 107
Naranjillas—The Golden Fruit of the Andes *Manuel Eduardo R. Chalons* 110
The White-Winged Dove of the Americas *George B. Saunders* 113
Gifts of the Americas—Orchids-----*Hally H. Conrad* 119

JULY—

Grasses of Brazil and Venezuela-------*Agnes Chase* 123
Bamboo---------------------------*Atherton Lee* 127

JULY—Continued. Page

In Quest of Quinine----------------*Claud L. Horn* 130
Copey Oak in Costa Rica------*William A. Dayton* 134
Gifts of the Americas—Ipecac---*Beatrice Du Frane* 139

AUGUST—

Latin America Produces More Rice--*Fred J. Rossiter* 143
The Canal Zone Experiment Gardens--*E. C. Higbee* 146
For Better Living in Brazil------*June Leith Nordin* 148
Science's Fight for Healthy Hevea--*M. H. Langford* 151
Training Farmers for São Paulo---*Robert E. Bowlus* 154
Gifts of the Americas—Mahogany--*Warren D. Brush* 159

SEPTEMBER—

The River Basins of Latin America *R. G. Hainsworth* 163
Mexico and the United States Discuss Mutual Farm Problems-----------------------*John J. Haggerty* 168
Escuela Agrícola Panamericana-----*Wilson Popenoe* 172

OCTOBER—

Protection From Insects------------*F. C. Bishopp* 183
Curare—Poison and Medicine-----*J. Gordon Leahy* 186
Growing Bananas on Acid Soil---*George D. Scarseth* 188
4-H Clubs in the Americas-----*Gertrude L. Warren* 190
Gifts of the Americas—The Sapodilla *Fred A. Motz* 198
The Amazon River Basin--------*R. G. Hainsworth* 199

NOVEMBER—

An Entomologist Looks at Costa Rica--*Paul Knight* 203
Mexico Reports------------*Philip Leonard Green* 209
A Brazilian Evaluates a Neighbor *Eduardo C. Pinheiro* 214
Gifts of the Americas—The Turkey--*Sophia Podolsky* 219
The Guayas Basin—Ecuador--------*Lewis E. Long* 220

DECEMBER—

The Forest Resources of Chile *Philip A. Briegleb* and *Irvine T. Haig* 223
Hevea Rubber Comes to Honduras *Edward T. Stanwood* 227
Mutual Planning for Progress in Agriculture *John J. Haggerty* 229
"Kilometer 47"----------------------*Guy L. Bush* 232
Gifts of the Americas—Carnauba Wax *Beatrice Du Frane* 239
The Magdalena River Basin—Colombia *Kathryn H. Wylie* 240

INDEX

Page

- Abacá, production, Latin America 8–12
- Agreements and arrangements—
  - cinchona, U. S.-5 republics 19
  - derris, Haiti-U. S. 18
  - food, Brazil-U. S. 18
  - pyrethrum, Brazil-U. S. 38
  - rice, Brazil-U. S. and Britain 57
  - rubber, Mexico-U. S. 213
- Agricultural—
  - census, Paraguay 38
  - crop diversification, Cuba 118
  - improvement—
    - in Ecuador 77
    - in Mexico 58
    - in Panama 77, 118
    - in Paraguay by farm credit 63–65
    - in Venezuela 77
  - museum, La Molina, Peru 30–32
  - products of Andes 3–7
  - schools. *See* Schools.
  - survey in Puerto Rico 82
  - *See* Mexican-United States Agricultural Commission.
- Airplane, transportation by—
  - of poultry 76
  - of toads and fish eggs 98
- Alpaca, in Andes 46–50
- Amazon—
  - food for rubber tappers 157
  - river basin, description 166, 199–200
- Andes—
  - agriculture in 3–7
  - highway 3–7
  - wool-bearing animals in 46–50
- Argentina—
  - Agricultural Department 58
  - jute cultivation 117
  - minimum farm labor wage 38
  - scab, campaign against 118
  - silos underground 137
- Assignments in Latin America—
  - Brazil—
    - Archer, W. Andrew 222
    - Langford, M. H 142
  - Canal Zone—Kowal, R. J 42
  - Colombia—
    - Culbertson, Raymond E 102
    - Lewis, Henry G 102
    - Morrison, Benjamin Y 22
    - Storie, R. Earl 102
    - Witt, Lawrence W 102
  - Ecuador—Horn, Claud L 42
  - Guatemala—
    - Cowgill, William H 202
    - Davis, William C 195
    - Fairchild, David G 222
  - Nicaragua—
    - Long, Lewis E 182
    - McDermott, Edward P 122
    - Tanner, Edward L 22
  - Peru—
    - Cooper, William C 42
    - Crandall, Bowen S 102
    - Horn, Claud L 42
    - Leonard, Olen E 142
    - Schutz, Harry H 62
  - Several countries—
    - Frutchey, Frederick P 222
    - Horn, Claud L 130–133, 222
    - Moore, Ross E 62, 122
    - Pendleton, Robert L 122
- Ayala, Ernesto, portrait 138
- Babbini, new insecticide 216
- Balsa—
  - boats, description 133
  - processing of, Costa Rica 137
  - substitute for 237
- Balsam of Peru, Nicaragua 177

Page

- Bamboo—
  - new uses for 138
  - use in American Tropics 127–129
- Bananas—
  - association of planters, Cuba 118, 197
  - dehydration, Central America 98
  - Panama disease, control of 188–189
- Barbasco, production in Peru 83–86
- Barber, Charles H.: Kapok, Gift of the Americas 59
- Beltsville Research Center 230–231
- Bishopp, F. C., Protection From Insects 183–185
- Blowgun, Indian use of 193
- Bolivia—
  - cinchona—
    - production 19
    - quest for, in Bolivia 130–133
  - fish hatchery, establishment 177
  - women rubber tappers 177
- Bowlus, Robert E.: Training Farmers for São Paulo 154
- Brazil—
  - castor oil, production 76
  - cauassu, source of wax 37
  - cinchona, production of 19
  - cold storage plant 97
  - cottonseed distribution 117
  - education, agricultural 78, 154, 232–234
  - Federal Territories, new 19
  - food agreement with U. S. 18
  - grain elevator project 177
  - grape, new red Niagara 97
  - grasses of 123–126
  - hevea hybrids, improvement of 37
  - irrigation projects 138
  - "Kilometer 47" 232–234
  - mechanized farm equipment 195
  - National Center of Agricultural Education and Research 78, 232–234
  - nutrition, training course 148–150
  - olives, oil substitutes for 177
  - pineapples, new varieties 137
  - Pinheiro, Dr. 2, 214–215
  - plywood, industry, increase of 98
  - pyrethrum agreement with U.S. 38
  - quinine, manufacture of 138
  - rice export agreement 57
  - road building, plans for 236
  - Salles, Dr. Apolônio, portrait 233
  - salt, production of 236
  - silk culture, use of refrigerators in 216
  - silk production, Espirito Santo 38
  - tannin factory, erection of 216
  - wine industry, Rio Grande do Sul 117
  - visitors in U. S. 62, 82, 122, 142, 235, 214–215
- Briegleb, Philip A., and Haig, Irvine T.: The Forest Resources of Chile 223–226
- Brush, Warren D.: Mahogany, Gift of the Americas 159
- Bush, Guy L.: "Kilometer 47" 232–234
- Camohmila Center, Mexican rural reconstruction center 51–53, 98
- Canal Zone—
  - cinchona, plantings 19
  - Experiment Gardens, Summit 146–147
- Caribbeans, strategic materials 76
- Carnauba wax, Gift of the Americas 239
- Carpish, divide in Andes 3–7
- Carretera Central, Andean highway 3–7
- Cashew, Gift of the Americas 79
- Castor oil, production in Brazil 76

Page

- Cattle—
  - improved breeding, Panama 37
  - Mexican—
    - certification 171, 211, 231
    - industry 103–106
  - *See also* Dairying.
- Cauassu, source of wax 37
- Central America—
  - River basins of 163–167
  - *See* under separate commodities and republics.
- Chalons, Manuel Eduardo R.: Naranjillas—Golden Fruit of the Andes 110–112
- Chase, Agnes: Grasses of Brazil and Venezuela 123–126
- Chile—
  - Ayala, Ernesto, return of 122
  - fishing industry, expansion 117
  - forest resources 223–226
  - forestry mission to 22
  - Fourth Farm Congress 37
  - new Minister of Agriculture 222
  - olives, production 197
  - onion producers' organization 236
  - rabbits for hat manufacture 216
  - school for fishermen 236
  - seed farm 76
  - soapbark industry 19
  - tung orchards 157
- Cinchona—
  - increased production 19
  - plantation in Costa Rica 177
  - research in Guatemala 62
  - search for, Bolivia 130–133
  - story of 43–45
- Citronella, Nicaragua 18
- Coffee—
  - organization, in Venezuela 77
  - products from 237
- Colombia—
  - agricultural mission to 102
  - Credit Institute, award of 216
  - dairy cattle industry 73–74
  - Director of Agriculture 2
  - jute, cultivation 117
  - land-use study, mission for 102
  - Magdalena River Basin 240
  - paper mill, Medellín 177
  - production, increase of 98
  - threshing machine, invention 236
  - trainees in U. S. 182
  - visitors to U. S. 122, 202
  - wool yarn, production of 137
- Conrad, Hally H.:
  - Orchids, Gift of the Americas 119
  - Cashew, Gift of the Americas 79
- Copey oak, forest, Costa Rica 134–135
- Corn, new types at Turrialba 76
- Costa Rica—
  - balsa, processing of 137
  - cinchona, production 19, 177
  - Copey oak forest, discovery 134–135
  - entomologist, observations of an 203–208
  - increased production, fund for 37
  - map and description 100
  - *See also* Inter-American Institute of Agricultural Sciences.
- Cottonseed, distribution, Brazil 117
- Crane, Julian C.: Soft Fiber From Roselle 27–29
- Credit, for farmers, Guatemala 138
- Cuba—
  - agricultural diversification 118
  - bananas, association 118, 197
  - cattle feed, labeling of 38
  - Confederación de Productores 216
  - dehydration plant 58
  - fishing school 117
  - 5-C Clubs 190–191
  - Food Congress 19

Page

- Cuba—Continued.
  - gift of smokes to U. S. Armed Forces 76
  - henequen, production of 69–72
  - kenaf harvester, use of 216
  - map and description 120
  - rabbits, experiments in raising 19
  - research, appropriation for 157
  - retirement, sugar workers 38
  - roselle, fiber from 27–29
- Culbertson, Raymond E.: Flowers That Fight Malaria 66–68
- Curare, uses of 186–187, 193–194
- Dahlberg, A. C.: Dairying in Nicaragua 33–35
- Dairying—
  - in Colombia 73–74
  - in Nicaragua 33–35
  - in Tingo María 24
  - *See also* Cattle.
- Davis, William C.: Pearl Harbor Sent Quinine Home 43–45
- Dayton, William A.: Copey Oak in Costa Rica 134–135
- Dehydration of—
  - bananas 98
  - vegetables 58
- Derris—
  - production 18
  - *See* Rotenone.
- Diet. *See* Food.
- Dominican Republic—
  - jute, production 138
  - map and description 160
- Dove, white-winged 113–114
- Du Frane, Beatrice:
  - Carnauba Wax, Gift of the Americas 239
  - Ipecac, Gift of the Americas 139
- Ecuador—
  - agronomy, new course in 97
  - cinchona, production 19
  - Guayas River Basin 220
  - Hacienda Pichilingue, experiment station 54–56
  - naranjillas, production 110–112
  - pyrethrum, production 66–68
- Education for farmers in—
  - Honduras, Escuela Agrícola Panamericana 172–174
  - São Paulo 154
- Edwards, Harry T.: Abacá—A New Crop for Latin America 8–12
- El Salvador—
  - cinchona, production 19
  - credit cooperatives, growth of 236
  - map and description 40
  - school lunches 57
  - workers coming to U. S 157
- Escuela Agrícola Panamericana 172–174
- Eucalyptus, cultivation, Andes 7
- Experiment stations—
  - Canal Zone Experiment Gardens 146–147
  - Costa Rica. *See* Inter-American Institute of Agricultural Sciences, Turrialba.
  - Ecuador, Hacienda Pichilingue 54–56
  - Honduras, Lancetilla 227–228
  - Peru—
    - La Molina 66
    - Tingo María. *See* Tingo María.
- Fairs—
  - Honduras 77
  - Panama 118
- Farm credit, Paraguay 63–65
- Fiber—
  - abacá, Latin America 8–12
  - henequen, Cuba 69–72
  - roselle 27–29

Page

- Fishing—
  - Chile, expansion of industry 117
  - Cuba, new school of 117
  - Venezuela, industry 58
- Food—
  - Congress, Cuba 19
  - increased production in Brazil and Central America 18
  - preservation of, by Incas 30–32
  - Hot Springs Conference 88–89
  - science of right diets 87–90
  - survey of, Panama 77
- Food and Agricultural Organization of the United Nations 197
- Forests—
  - Chile's resources 223–226
  - Copey oak, discovery of 134–135
  - Mexico's resources 210
- Forestry, mission to Chile 22, 223–226
- 4-H Clubs in the Americas 190–191
- Fruits. *See* under specific kinds
- Fungus, "Insect trapper" 237
- Gifts of the Americas—
  - Carnauba wax 239
  - Cashew 79
  - Guava 99
  - Ipecac 139
  - Kapok 59
  - Mahogany 159
  - Orchids 119
  - Pineapple 39
  - Sapodilla 198
  - Turkey 219
- Grape, new red Niagara 97
- Grasses of Brazil and Venezuela 123–126
- Green, Philip Leonard: Mexico Reports 209–213
- Guanaco, in Andes 46–50
- Guatemala—
  - cinchona, production 19, 62
  - coffee workers census 157
  - credit for small farmers 138
  - map and description 20
- Guava, Gift of the Americas 99
- Hacienda Pichilingue, experiment station, Ecuador 54–56
- Haggerty, John J.:
  - Mexico and the United States Discuss Mutual Farm Problems 168–171
  - Mutual Planning for Progress in Agriculture 229–231
- Haig, Irvine T., and Briegleb, Philip A.: The Forest Resources of Chile 223–226
- Hainsworth, R. G.:
  - Amazon River Basin 199–200
  - River Basins of Latin America 163–167
- Haiti—
  - derris, production 18
  - map and description 140
- Hatch, D. Spencer:
  - Rural Reconstruction in Mexico 51–53
  - success of project 98
- Henequen. *See* Fibers.
- Hevea. *See* Rubber.
- Higbee, E. C.:
  - Agriculture Across the Andes 3–7
  - Canal Zone Experiment Gardens 146–147
  - Lagunas—Barbasco Capital of the World 83–86
- Hodgson, R. E.: Dairy Cattle of Colombia 73–74
- Honduras—
  - agricultural school 172–174
  - Director of Agriculture 22
  - fairs, expositions in 1944 77
  - Lancetilla, hevea plantings 227–228
  - map and description 60

Page

- Horn, Claud L.: In Quest of Quinine 130–133
- Hull, William X.: Collaborators in Soil Conservation 91–93
- Iguassú Falls, picture of 165
- Indian, Inter-American Institute 202
- Insecticides. *See* Babbini; Derris; Lonchocarpus; Pyrethrum; Rotenone.
- Insects—
  - control of, Costa Rica 203–208
  - fungus "trapper" for 237
  - protection from 183–185
- Inter-American—
  - Conferenceon Agriculture (second), report from 209–213
  - Economic Conference 137
  - Institute of Agricultural Sciences, Turrialba—
    - convention for permanent status, signatories 57, 98
    - corn, new types 76
    - research in foods 89
    - Rubber Plant Station at 158
  - workshop, University of Denver 117
- Ipecac, Gift of the Americas 139
- Irrigation, projects in—
  - Brazil 138
  - Mexico 77, 210
  - Peru 58
- Jaboticabal, school in São Paulo 154
- Johnson, E. C.: Paraguay Improves Its Agriculture 63–65
- Johnson, Esther H.: Mexico's Cattle Industry 103–106
- Jute, cultivation in—
  - Argentina and Colombia 117
  - Dominican Republic 138
- Kapok, Gift of the Americas 59
- Knight, Paul: An Entomologist Looks at Costa Rica 203–208
- Lagunas, barbasco capital 83–86
- La Molina—
  - agricultural museum 12, 30–32
  - experiment station 66
- Lancetilla. *See* Honduras; Experiment Stations.
- Langford, M. H.: Science's Fight for Healthy Hevea 151–153
- Leahy, J. Gordon: Curare—Poison and Medicine 186–187
- Lee, Atherton:
  - Bamboo 127–129
  - awards in agriculture; portrait 97
  - United Fruit Co., position with 42
- Lester, Allen H.: Henequen From Cuba 69–72
- Librarians, visit, Latin America 142
- Lincoln, Frederick C.: Wildlife Management in the Americas 13–17
- Lindseed, crop injury, Uruguay 37
- Livestock—
  - problems in Tingo María 24
  - *See also* Cattle; Dairying.
- Llama, in Andes 46–50
- Llanos, plains of Orinoco Basin 166
- Lonchocarpus 83
- Long, Lewis E.:
  - Guayas Basin—Ecuador 219
  - Hacienda Pichilingue 54–56
- Loomis, Charles P.: Extension Work at Tingo María 23–26
- Mahogany—
  - Gift of the Americas 159
  - sawmill for, Venezuela 177
- Malaria, control by pyrethrum 66–68
- Map and description of—
  - Costa Rica 100
  - Cuba 120
  - Dominican Republic 160

Page

- Maps and description of—Con.
  - El Salvador 40
  - Guatemala 20
  - Haiti 140
  - Honduras 60
  - Mexico 179–180
  - Nicaragua 80
- Mexican-U. S. Agricultural Commission, meetings, reports—
  - July 1944, Mexico City 142, 162, 168–171
  - October 1944, Washington 229–231
- Mexico—
  - agricultural advancement 58
  - Camohmila Center project 51–53, 98
  - cattle industry 103–106, 171, 211, 231
  - cinchona, production 19
  - corn, excess supplies 38
  - forest resources 210
  - irrigation, expansion of 77
  - map and description 179–180
  - "new ties across the border" 162
  - progress report 209–213
  - river basins of 163–164
  - rural reconstruction 51–53, 171, 211–213, 231
  - visitors in U. S 82, 122, 182, 202
- Molasses ("snake") grass 126
- Motz, Fred A.:
  - Guava, Gift of the Americas 99
  - Sapodilla, Gift of the Americas 198
- Naranjilla, fruit in Ecuador 110–112
- Nicaragua—
  - balsam of Peru, purchase of 177
  - cinchona, production 19
  - citronella, production 18
  - crop diversification 18
  - dairying industry 33–35
  - map and description 80
  - peanuts, production 19
  - visitor to United States 62
- Nold, Truman: Pineapple, Gift of the Americas 39
- Nordin, June Leith: For Better Living in Brazil 148–150
- Nutrition, new training course, Brazil 148–150
- Oak, Copey, forest in Costa Rica 134–135
- Office of Foreign Agricultural Relations, establishment of Technical Collaboration Branch 182
- Olives—
  - production, Chile 197
  - oil substitutes for 177
- Orchids, Gift of the Americas 119
- Pan American Union—
  - conference on post-war problems 77
  - host to Agricultural Commission 229
- Panama—
  - agricultural fair 118
  - back-to-farm program 37
  - improved living standards 77
  - visitor to United States 202
- Panama Disease of bananas 188–189
- Paraguay—
  - census, agricultural 38, 197
  - farm credit system 63–65
  - quebracho, production 76
- Peanuts, production, Nicaragua 19
- Peru—
  - agricultural museum, La Molina 30–32
  - agriculture along Carretera Central 3–7
  - barbasco, production 83–86
  - cinchona, production 19, 43
  - health school 97

Page

- Peru—Continued
  - irrigation project 58
  - La Molina, experiment station 66
  - new insecticide, Babbini 216
  - potato improvement 94–95
  - pyrethrum, production 66–68
  - tomato, wild 38
  - Victory Gardens 77
  - visitor to U. S 222
  - *See also* Tingo María; Experiment Stations
- Pineapple—
  - Gift of the Americas 39
  - new varieties in Brazil 137
- Pinheiro, Eduardo C.:
  - A Brazilian Evaluates a Neighbor 214–215
  - student in U. S 2
- Plywood, industry in Brazil 98
- Podolsky, Sophia: Turkey, Gift of the Americas 219
- Poisoned darts, curare 187
- Popenoe, Wilson: Escuela Agrícola Panamericana 172–174
- Potato improvement in Peru 94–95
- Puerto Rico—
  - cinchona, production 19
  - survey, agricultural 82
  - vanilla vines, cultivation 118
- Pyrethrum—
  - agreement, Brazil-U. S 38
  - bombs 66
  - production in—
    - Andes 7, 12
    - Peru and Ecuador 66–68
- Quebracho—
  - manufacture of tannin from 216
  - production, Paraguay 76
- Quillay, soapbark industry, Chile 19
- Quinine—
  - manufacture of, Brazil 138
  - *See* Cinchona.
- Quipo, substitute for balsa 237
- Rabbits, raising of, in
  - Chile 216
  - Cuba 19
- Reading About the Americas, each month except January and March
- Rice—
  - Brazil's agreement with U. S. and Britain 57
  - production, Latin America 143–145
- River Basins—
  - Amazon 199–200
  - Guayas—Ecuador 220
  - Latin America 163–167
  - Magdalena—Colombia 240
- Rolfs, Dr. Peter Henry, death of 82
- Roselle, production 27–29
- Rossiter, Fred J.: Latin America Produces More Rice 143–145
- Rotenone—
  - from barbasco 83–86
  - from derris 18
  - production, Pichilingue 54–56
- Rubber—
  - coagulating plant 56
  - food for tappers, Amazon 157
  - Hevea—
    - budgrafting, improvement 62
    - hybrids, improvement, Brazil 37
    - leaf blight, fight against 151–153
    - plantings, Honduras 227–228
  - women tappers 177
- Rural reconstruction in Mexico 51–53, 171, 211–213, 231
- San Marcos, University of 82
- São Paulo, agricultural schools 154
- Sapodilla, Gift of the Americas 198

Page

- SAPS, Serviço de Alimentação da Previdencia Social, Brazil 148–150
- Saunders, George B.: The White-Winged Dove of the Americas 113–114
- Scarseth, George D.: Growing Bananas on Acid Soil 188–189
- Schools, agricultural—
  - Brazil 154, 232–234
  - Costa Rica 57
  - Honduras 172–174
- Seeds for post-war Europe 76
- Silk—
  - culture, use of refrigerators in 216
  - production in Brazil 38
- Soil conservation—
  - Mexican problems in 210
  - training program 91–93
- South America, river basins 165–167
- Stanley, Louise: Can We Have the Right Food? 87–90
- Stanwood, Edward T.: Hevea Rubber Comes to Honduras 227–228
- Strategic materials from the Caribbean Islands 76
- Sugar, mosaic disease 147
- Summit, Canal Zone, Experiment Gardens 146–147
- Taeusch, Carl F.: Toward Practical Cooperation 107–109
- Tannin. *See* Quebracho.
- Tappy, Elizabeth P.: Sheep of the Andes 46–50
- Teak, experiments with 147
- Termites, protection against 42
- Tingo María—
  - colonization project 23–26
  - government appropriation for 118
  - valley of 4–5
- Tomato, wild, in Peru 38
- Trainees, Latin American, in U. S 2, 42, 91–93, 102, 107–109, 122, 182, 214–215
- Tung, orchards, in Chile 157
- Turkey, Gift of the Americas 219
- Turrialba. *See* Inter-American Institute.
- United Fruit Company, agricultural school, Honduras 172–174
- Uruguay—
  - linseed, affected by drought 37
  - wool, long staple, production 77
- Vanilla vines, cultivation 118
- Venezuela—
  - coffee growers organization 77
  - fishing industry, increase 58
  - 5-V Clubs 190
  - grasses of 123–126
  - progress in agriculture 77
  - sawmill, Yaracuy 177
  - visitor in U. S 202
- Vicuña, in Andes 46–50
- Vivanco, Carlos F.: Agricultural Museum in Peru 30–32
- Warren, Gertrude L.: 4-H Clubs in the Americas 190–191
- Wax—
  - carnauba 239
  - from canassu 37
- West Indies, river basins 176
- Wildlife—
  - in the Americas, protection of 13–17
  - white-winged dove 113–114
- Wine industry, Rio Grande do Sul 117
- Wool—
  - long staple, in Uruguay 77
  - sheep of the Andes 46–50
  - yarn, production in Colombia 137
- Wylie, Kathryn H.: Magdalena River Basin—Colombia 240